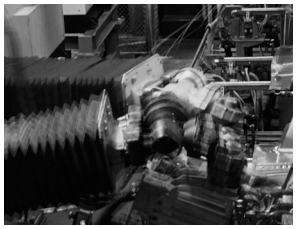
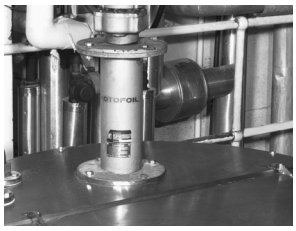
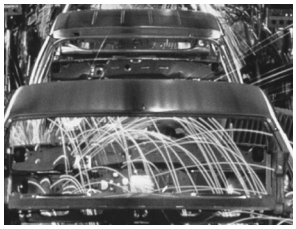
LISTEN.
THINK.
SOLVE.℠

MSR312P Configurable Monitoring Safety Relay with DeviceNet™ Communications







USER MANUAL

440R

ALLEN-BRADLEY • ROCKWELL SOFTWARE

Rockwell Automation

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Rockwell Automation Publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Rockwell Automation office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Reproduction of the contents of this copyrighted publication, in whole or part, without written permission of Rockwell Automation, is prohibited.

Definition of Symbols

ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequences.

Throughout this manual we use notes to make you aware of safety considerations:

Attention statements help you to:

- identify a hazard
- avoid a hazard
- recognize the consequences

IMPORTANT	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequences.

Allen-Bradley, RSNetWorx, DeviceLogix, PLC, and SLC are registered trademarks of Rockwell Automation.
DeviceNet is a trademark of the Open DeviceNet Vendor Association (ODVA).

European Communities (EC) Directive Compliance

This product has the CE mark and is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

This product is tested to meet the Council Directive 89/336/EC Electromagnetic Compatibility (EMC) by applying the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2 EMC — Generic Emission Standard, Part 2 — Industrial Environment
- EN 50082-2 EMC — Generic Immunity Standard, Part 2 — Industrial Environment

This product is intended for use in an industrial environment.

Low Voltage Directive

This product is not required to meet Council Directive 73/23/EEC Low Voltage, as it is designed for use with a voltage rating below 50V for alternating current and below 75V for direct current. The requirements of EN 60947-5-1:1997 Low-Voltage Switchgear and Controlgear, Part 5 — Control Circuit Devices, have been applied.

Preface

ATTENTION	Read this manual in its entirety before installing, operating, servicing, or configuring the MSR312P Safety Relay with DeviceNet communications.

The purpose of this manual is to provide you with the necessary information to apply the MSR312P Safety Relay using DeviceNet™ with DeviceLogix Component Technology. Described in this manual are methods for installing, configuring, and troubleshooting the MSR312P DeviceNet.

Intended Audience

This manual is intended for qualified personnel responsible for the setup and service of these devices. You must have previous experience with and a basic understanding of communications terminology, configuration procedures, required equipment, and safety precautions.

You should understand the DeviceNet network operations, including how slave devices operate on the network and communicate with a DeviceNet master.

You should be familiar with the use of the RSNetWorx for DeviceNet Software (Cat. No. 9357-DNETL3) for network configuration. This software package is referred to often in this manual.

ATTENTION	Read the DeviceNet Cable System Planning and Installation Manual, Publication 1485-6.7.1, in its entirety before planning and installing a DeviceNet System. If the network is not installed according to this document, unexpected operation and intermittent failures can occur. If this manual is not available, consult your local Rockwell Automation Authorized Distributor or Sales Office to request a copy. Copies may also be ordered from the Rockwell Automation Bookstore. The bookstore can be contacted via the Internet from the Rockwell Automation home page at http://www.rockwellautomation.com. Only personnel familiar with DeviceNet devices and associated equipment should plan or implement the installation, startup, configuration, and subsequent maintenance of the MSR312P Configurable monitoring Safety Relay. Failure to comply may result in personal injury and/ or equipment damage.

Vocabulary

In this manual we refer to the MSR312P Safety Relay with DeviceNet Communications with DeviceLogix Component Technology as the “MSR312P.”

Related Publications

Publication Title	Publication Number
DeviceNet™ Cable System Planning and Installation Manual	DN-6.7.2
ControlLogix™ DeviceNet Interface Module User Manual	1756-6.5.19
DeviceNet Media Catalog Guide	1485-CG001A-EN-P

Online Information

EDS Files: EDS files are available for downloading at http://www.ab.com/networks/eds.

Manuals Online: Manuals are available for order or download at http://www.theautomationbookstore.com

This manual gives an overview of the MSR312P and describes how to configure, install, operate, and troubleshoot the device on the DeviceNet network.

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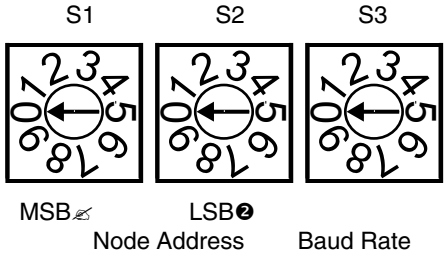
Chapter 1: Overview of the MSR312P DeviceNet Base Module

Description

The MSR312P offers DeviceNet connection for applications in which network communication is desired. All of the functionality of the DeviceNet interface is contained within the enclosure. The base unit requires two 24V DC power sources. One is connected to A1/A2 terminals to power the safety circuitry including all connected modules. The second is the DeviceNet power. It's recommended that they do not share the same source.

Rotary Switches

The MSR312P has three 10-position rotary switches for setting: DeviceNet baud rate and DeviceNet node address The switches are located on the side of the enclosure. The switch settings and functions are shown below.



✍ MSB = Most Significant Byte
❷ LSB = Least Significant Byte

Node Address Configuration

Rotary switches S1 and S2 are used to set the node address (0…63) of the MSR312P. The factory default is 63 on the switches. If the node address is between 64…99, the MAC ID will be software settable. Rotate switches S1 and S2 to the desired address.

Data Rate Configuration

Rotary switch S3 sets the data rate at which the MSR312P communicates with the network. The factory default setting is 0…125 kb.

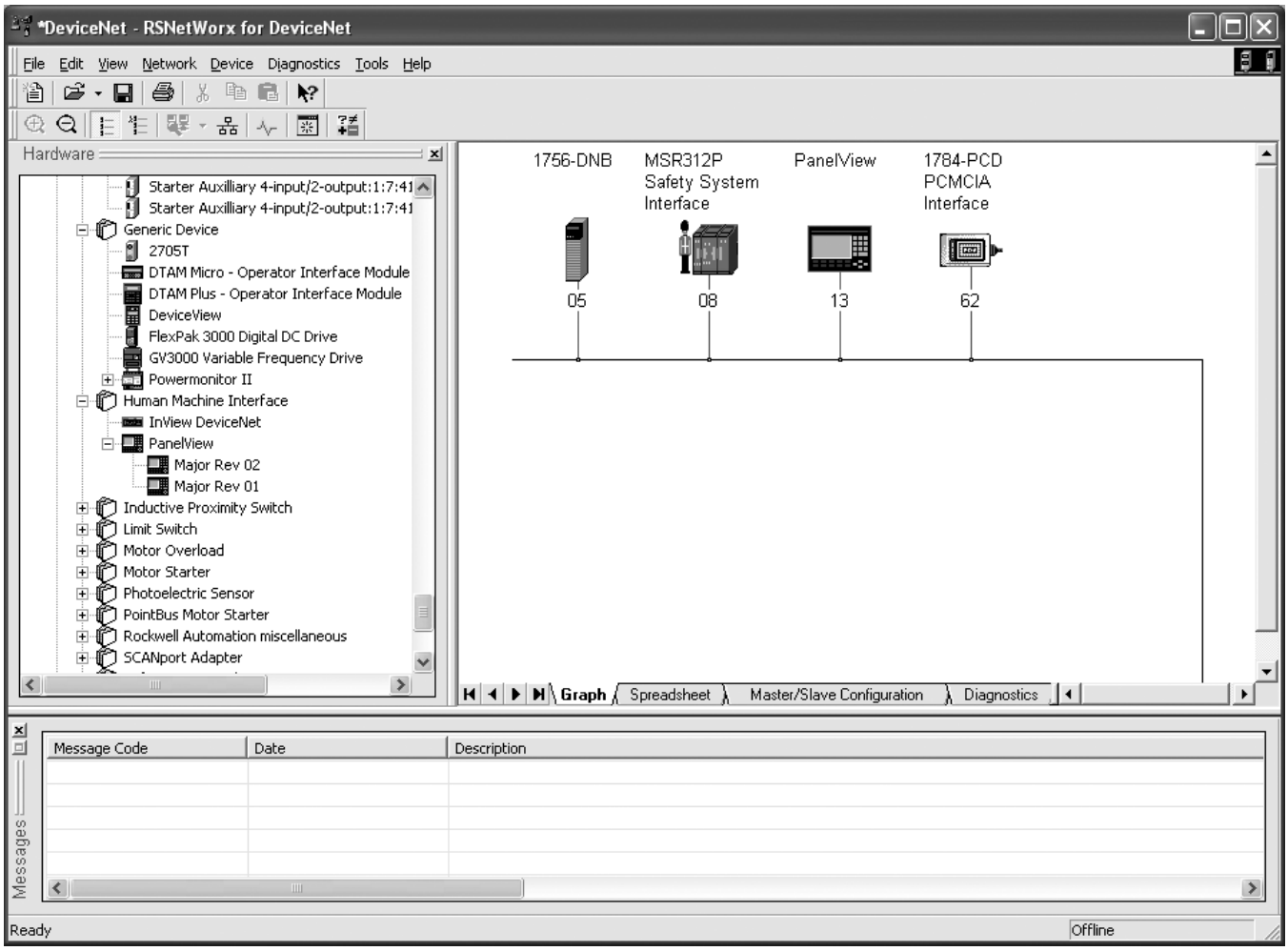
DeviceNet Connection

The MSR312P DeviceNet communications receives its power and communications through the DeviceNet Cable. A separate power supply is required to power the MSR312P for its safety functions. This separate power supply must be connected to terminals A1 and A2 of the MSR312P.

- CANH – White Wire
- CANL – Blue Wire
- V+ – Red Wire
- V- – Black Wire
- SHD – Shield

Parameter Configuration

For proper operation, the parameters of the MSR312P must be configured. There are 105 parameters in the MSR312P, but only 11 of them are configurable. The parameters can be configured by using RSNetWorx for DeviceNet. Open RSNetWorx and double click on the MSR312P icon.



Chapter 2: Troubleshooting and Maintenance

Using the Status LED

Function	Status LED	Group 1-2-3 LEDs
Power up / normal operation	Continuous on: green	—
Internal fault	Continuous on: red	—
Entering configuration mode	1 flash: red	—
Input switch fault or reset switch closed during power up	2 flashes: red	—
Configuration change during operation	3 flashes: red	—
Current configuration not as stored on EEPROM	4 flashes: red	—
At least one muting lamp and one reserve lamp defective	5 flashes: red	—
Invalid switch settings of input modules	6 flashes: red	—
Invalid reset configuration (Y41, Y42, S34 terminal jumpers)	7 flashes: red	—
Input terminal block not (or improperly) plugged in	8 flashes: red	—
Group output active	—	Continuous on: green
Group ready	—	Blinking: green
At least one input corresponding to the output group is faulty	—	Continuous on: red
A feedback (EDM) loop of the output group is open, or no input is assigned to the group	—	Off

Using the Mod/Net Status LED

Mod/Net State	LED	Indication
Not powered/not on-line	Off	Device is not on-line. Device has not completed the Dup MAC ID test. Device may not be powered.
Device operational and on-line, connected	Solid green	Device is operating in a normal condition and is on-line with connections in the established state. For Group 2 only, the device is allocated to a master.
Device operational and on-line, not connected, or device on-line and needs commissioning	Flashing green	Device is on-line with no connections in the established state. Device has passed the Dup MAC ID test, is on-line, but has no established connections to other nodes. For a Group 2 Only device, the device is not allocated to a master.
Minor fault and/or connection time-out	Flashing red	Recoverable fault and/or one or more I/O connections are in the timed-out state. Recoverable faults include: • Failed Power Supply power-up test. • Faulted 24V DC, Out2, Out3.
Critical fault or critical link failure	Solid red	Device has an unrecoverable fault and may need replacing. Device has detected an error that has rendered it incapable of communication on the network (Dup MAC failure or Bus Off).

Chapter 2: Device Parameters

Parameter 1 to 20—Input Values (read only)

Input 1a Value - Input 10b Value

The MSR312P supports up to 10 inputs modules to its input side. Each input module has two independent input connections. These are shown as parameters Input 1a Value (the top wiring connection of the module) and Input 1b Value (the bottom connection for input module 1). The input values can be either ON or OFF. Input values not used will show an OFF value.

A value of ‘ON’ indicates that the input is active. A device is connected properly and the input LED on the front of the module is green.

A value of 'OFF' indicates that the input is not active. The Input LED on the front of the module is red. This may be due to various reasons, including:

- An operator intentionally triggered the attached device (such as by releasing a two-hand control or stepping on a safety mat),
- An off-wire condition in which a wire has physically fallen off the input,
- The device was removed from the channel, or
- The simultaneity monitoring time limit (if enabled) may have been exceeded.

Parameter 21 to 23—Input Module Values (read only)

Input Modules 1…10 State

The purpose of these parameters is to allow the reading of multiple modules in a single byte, rather than reading each individual status of parameters 1 through 20. Parameter 21 includes the first four modules. Parameter 22 contains status of modules 5-8, and Parameter 23 contains the status of modules 9 and 10. A '1' or check indicates the input is active; otherwise the input is not active. Module 1 is the input module closest to the base module (on the left). Modules count from right to left, respectively, to the base module.

Value	Meaning
0	Input inactive
1	Input active

Parameters 24 to 26—Simultaneity Errors (read only)

Simultaneity Enabled Input Modules 1…10

These parameters indicate that the simultaneity time period for the selected application has elapsed without all required input contacts having been reset. See Parameters 27 to 29 for more details.

An example value on Parameter 24 might be: 00000001

The “1” value indicates that Input 1a had a simultaneity error. The Input LED on the front of the module will be blinking red. The Status LED on the MSR312P will be blinking at a 2X rate, indicating an input fault.

Parameters 27 to 29—Simultaneity Enabled (read only)

Simultaneity Enabled Input Modules 1…10

Dual channel and triple channel input devices, like e-stops, safety gates and safety mats can be connected so that the MSR312P looks for each channel to become active within 3 seconds of each other. Simultaneity is enabled through wiring configuration only; the user cannot enable this feature via software (see the MSR300 Instruction Manual).

These parameters indicate if simultaneity monitoring (sometimes referred to as synchronization monitoring or coincidence gating) has been enabled for the channels. Simultaneity monitoring requires that should an input enter a faulted state, resetting all input contacts of a channel (or channels, depending upon application selected) must be accomplished within a certain time period. For 2- or 3-channel operation, this time period is fixed at three seconds, while for two-hand control applications the time period is fixed at 0.5 seconds.

An example value on Parameter 24 might be: 00000001

The “1” value indicates that Input 1a has simultaneity enabled. The other inputs are not using the simultaneity feature.

Parameters 30 to 32—Group Status (read only)

Group 1…3 Status

These parameters indicates if any of the MSR320P Input Modules assigned to Groups 1, 2 or 3 have an interrupted input. The meaning of the values are:

Value	Meaning
00	Inputs are active—OK
01	At least one input assigned to the Group is interrupted.

Parameters 33 to 35—Feedback (Monitoring) Loop Status (read only)

Group 1…3 EDM Status

The Feedback Loop Status parameters reflect the status of the EDM circuits at terminals Y11, Y12 and Y13. The meaning of the values are:

Value	Meaning
00	Feedback Loop Open
01	Feedback Loop Closed

Parameters 36 to 38—Group State (read only)

Group 1…3 State

The Group State parameters reflects the status of the Group 1, 2 and 3 output modules. The meaning of the values are:

Value	Meaning
00	Output is off
01	Output is ready for reset
10	Output is active

Parameters 39—Group Reset State (read only)

The MSR312P can be set up for four different reset modes. These modes are configured by wiring only; they cannot be changed by software. The setting are made at the terminals Y40, Y41, and Y42

Parameter 39 value: XXXX0000	Jumper from Y40 to Y41 and Y42 Group 1, 2 and 3: Automatic Reset
Parameter 39 value: XXXX0001	Jumper from Y40 to Y41 Group 1 and 2: Monitored Manual Reset Group 3: Automatic Reset
Parameter 39 value: XXXX0010	Jumper from Y40 to Y42 Group 1 and 2: Automatic Reset Group 3: Monitored Manual Reset
Parameter 39 value: XXXX0011	No Jumpers Group 1, 2 and 3 Monitored Manual Reset

Parameters 40-49—Function Settings (read only)

Function Switch Value Module 1…10

These parameters indicate the actual rotary switch settings on MSR320 Input Modules. There is one parameter for each module. Parameter 40 is the input module closest to the base module. These values should be compared to their respective values in nonvolatile memory (Parameters 50-59). If the values are not the same, the MSR300 system will be in a faulted state.

0. Reserved
1. One-Channel Emergency Stop
2. Two-Channel Emergency Stop, Safety Mat
3. Three-Channel Emergency Stop
4. Two-Channel Safety Gate w/ Start-Up Test
5. Two-Channel Safety Gate w/o Start-Up Test
6. Two-Channel Light Curtains
7. Two-Hand Control
8. Input 1: Two-Channel Emergency Stop, Input 2: Light Curtain (2NC, 2 OSSD)
9. Input 1: Two-Channel Safety Gate, Input 2: Light Curtain (1NO & 1NC, 2 OSSD)

No value = The module is a muting lamp module.

Reserved = The module does not exist in the system.

Parameters 50-59—Nonvolatile (EEPROM) Function Settings (read only)

Function NV Value Module 1…10

These parameters indicate the rotary switch settings that are stored in nonvolatile memory in the base module. There is one parameter for each module. Parameter 50 is the input module closest to the base module. These should be compared to their respective values in actual settings (Parameters 40-49). If the values are not the same, the MSR300 system will be in a faulted state.

0. Reserved
1. One-Channel Emergency Stop
2. Two-Channel Emergency Stop, Safety Mat
3. Three-Channel Emergency Stop
4. Two-Channel Safety Gate w/ Start-Up Test
5. Two-Channel Safety Gate w/o Start-Up Test
6. Two-Channel Light Curtains
7. Two-Hand Control
8. Input 1: Two-Channel Emergency Stop, Input 2: Light Curtain (2NC, 2 OSSD)
9. Input 1: Two-Channel Safety Gate, Input 2: Light Curtain (1NO & 1NC, 2 OSSD)

No value = The module is a muting lamp module.

Reserved = The module does not exist in the system.

Parameters 60-69—Group Switch Settings (read only)

Group Switch Value Module 1…10

These parameters indicate the actual Group switch setting on the MSR320P Input Modules. There is one parameter for each module. Parameter 60 is the input module closest to the base module. These values should be compared to their respective values in nonvolatile memory (Parameters 70-79). If the values are not the same, the MSR300 system will be in a faulted state.

0. OR Logic Function
1. Group 1
2. Group 2
3. Group 1 and 2
4. Group 3
5. Group 1 and 3
6. Group 2 and 3
7. Group 1 and 2 and 3
8. Robot Function Including Muting
9. Additional Safe Area

OR Logic Function = Default value for non-existent modules

Parameters 70-79—Group Switch Nonvolatile (EEPROM) Settings (read only)

Group NV Value Module 1…10

These parameters indicate the Group switch settings stored in the nonvolatile memory in the base module. There is one parameter for each module. Parameter 70 is the input module closest to the base module. These should be compared to their respective values in actual settings (Parameters 60-69). If the values are not the same, the MSR300 system will be in a faulted state.

0. OR Logic Function
1. Group 1
2. Group 2
3. Group 1 and 2
4. Group 3
5. Group 1 and 3
6. Group 2 and 3
7. Group 1 and 2 and 3
8. Robot Function Including Muting
9. Additional Safe Area

OR Logic Function = Default value for non-existent modules

Parameters 80—System Faults (read only)

This parameter provides indication of a variety of faults that the system may acquire.

Bit 0	Invalid Code switch Setting
Bit 1	The number of extension modules does not equal nonvolatile (EEPROM) number
Bit 2	Cross Loop
Bit 3	Internal Fault
Bit 4	Terminal connector is missing
Bit 5	Configuration changed during operation
Bit 6	Any hardware failure
Bit 7	Current configuration does not equal nonvolatile (EEPROM) configuration

Example: 00011100—indicates that the terminal connector on the extension module was removed during operation. This also causes Bit 3 to be set.

Parameters 81—Any System Fault (read only)

This parameter provides indication if there is any system faults present. If any of the bits in Parameter 80 are set to 1, the value of parameter 81 is set to 1. Otherwise this value is 0.

Parameters 82—Muting Lamp Module Faults (read only)

This parameter provides indication of a variety of faults that the MSR329P Muting Lamp Module may acquire.

Bit 0	Muting Lamp 1 Faulty
Bit 1	Reserve Lamp 1 Faulty
Bit 2	Muting Lamp 2 Faulty
Bit 3	Reserve Lamp 2 Faulty

Parameters 83—Output Y34 Value

This parameter allows the user to trigger a semiconductor output on terminal Y34 that can be used for a variety of purposes:

- to trigger a reset of one of the Groups,
- to turn on an external device, or
- to feed back to an input, allowing the user control over activation of a Group.

The allowable values are:

- 0 = Inactive
- 1 = Active

Parameters 84—Output Y34 Status

This parameter shows the status of the Semiconductor Output (see Parameter 83). A loss of power on the safety side will cause a Failure. The allowable values are:

- 0 = OK
- 1 = Failure

Parameters 85—Output Y34 Fault Action

This parameter allows the user to select what value is output upon detection of a Semiconductor Output (Parameter 84) Failure. The user may choose a preset value, as defined in Semiconductor Output Fault Value (Parameter 83), or may opt to specify that the Semiconductor Output holds its last value. The allowable values are:

- 0 = Fault Value
- 1 = Hold Last State

Parameters 86—Output Y34 Fault Value

This parameter defines what value should be output for Fault Value. The allowable values are:

- 0 = Off
- 1 = On

Parameter 87—Output Y34 Idle Action

This parameter allows the user to select what value is output when the Semiconductor Output is in the recoverable fault state. The user may choose a preset value, as defined in Semiconductor Output Idle Value, or may opt to specify that the Semiconductor Output holds its last value. The allowable values are:

- 0 = Idle Value
- 1 = Hold Last State

Parameter 88—Output Y34 Idle Value

This parameter defines what value should be output for Idle Value. The allowable values are:

- 0 = Off
- 1 = On

Parameter 89—Autobaud

When enabled (recommended), the device will configure its own baud rate according to the network baud rate, unless a valid baud rate is specified using the baud rate switches. If disabled, the baud rate shall default to the baud rate stored in nonvolatile memory, unless a valid baud rate is specified using the baud rate switches. All devices on a network must have the same baud rate. The allowable values are:

- 0 = Enabled
- 1 = Disabled

Parameter 90—Baud Rate NV (read only)

This parameter is the stored value in the base module for the baud rate switch from power up.

Parameter 91—Baud Rate Switch Change (read only)

This parameter identifies if the baud rate switch value has been changed since power-up.

- 0 = Not changed
- 1 = Changed

Parameter 92—Baud Rate Switch Value (read only)

This parameter identifies the baud rate stored in nonvolatile memory. If Autobaud is set to disabled and a valid baud rate is not specified using the baud rate switches, this value shall become the default baud rate. The allowable values are:

- 0 = 125KB
- 1 = 250KB
- 2 = 500KB
- 3 – PGM
- 4 – PGM
- 5 – PGM
- 6 – PGM
- 7 – PGM
- 8 – PGM
- 9 – Force Autobaud

Parameter 93—MAC ID Switch Change (read only)

This parameter identifies if the MAC ID switch value has been changed since power-up. The allowable values are:

- 0 = Not Changed
- 1 = Changed

Parameter 94—MAC ID Switch Value (read only)

This parameter identifies the MAC ID set by the rotary DIP switches on the MSR312P Module. The allowable values lie in the range of 0 to 63.

Parameter 95—Configuration Consistency Value (read only)

This parameter indicates the unique value of an installation. The value lies in the range of 0 to 65535

Parameter 96—Serial Number (read only)

This parameter provides a unique identifier when multiples of the same product are being used on a network. The allowable values lie in the range from 0 to 4294967295.

Parameter 97—Runtime (read only)

The number of hours the device has been operating. This value is updated every 2 hours and resets after each power-up.

Parameter 98—Power-up Count (read only)

The total number of times the device has been power cycled.

Parameter 99—DeviceNet Voltage (read only)

This parameter gives the network voltage seen by the device. Voltages outside of the specified range of 11-25V DC may cause the device to report inaccurate information and should not be relied upon.

Parameter 100—Number of Input Modules (read only)

Number of Input Modules NV

This parameter indicates the number of MSR320P or MSR329P Input Modules currently attached to the system. A mismatch between this value and the number of Input Modules stored in nonvolatile memory will cause a fault.

Parameter 101—Number of Input Modules in Nonvolatile Memory (EEPROM) (read only)

This parameter indicates the number of MSR320P or MSR329P Input Modules stored in nonvolatile memory. A mismatch between this value and the number of actual Input Modules will cause a fault.

Parameter 102—MSR Processor Version Number (read only)

This parameter indicates the version number of the microprocessors in the MSR312P module.

Parameter 103—105: Input Assembly (POLL, COS, and Strobed)

These three parameters allow the user to read and set preselected data assemblies. Select Parameter 103 for Polling, 104 for COS and 105 for Strobing. The choices for each parameter are the same, and are made by a pull down menu. To change the selection, remove the MSR312P from the Scanlist, then apply and download the change. The selections are:

1. Group State, Group Status and System Status: Group State with Status

This consists of 2 bytes in (Parameters 30–32, 36–38 and 81)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
In 0	Reserved	Reserved	Group 3 Active	Group 3 Ready	Group 2 Active	Group 2 Ready	Group 1 Active	Group 1 Ready
In 1	Reserved	Reserved	Reserved	Reserved	Reserved	Group 3 Interrupted	Group 2 Interrupted	Group 1 Interrupted

2. System and Muting Lamp Diagnostic Byte.

This consist of 2 bytes in (Parameters 80 and 82)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
In 0	Current config unlike stored config	Any hardware failure	Config changed during operation	Terminal connector is missing	Internal Fault	Cross Loop	Actual # Modules not equal to memory value	Invalid code switch setting
In 1	Reserved	Reserved	Reserved	Reserved	Reserve Lamp 2 Faulty	Muting Lamp 2 Faulty	Reserve Lamp 1 Faulty	Muting Lamp 1 Faulty

3. Value of Input Module 1: Safety Input 1a-1b Values

This consists of 1 byte in (Parameters 1 and 2)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
In 0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Input 1b Value	Input 1a Value

4. Values of Input Modules 1–4: Safety Input 1a-4b Values

This consists of 1 byte in (Parameters 1–8)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
In 0	Input 4b Value	Input 4a Value	Input 3b Value	Input 3a Value	Input 2b Value	Input 2a Value	Input 1b Value	Input 1a Value

5. Value of Input Module 1 and System Status: Safety Input 1a-1b with Status

This consists of 1 byte in (Parameters 1, 2 and 81)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
In 0	System Status	Reserved	Reserved	Reserved	Reserved	Reserved	Input 1b Value	Input 1a Value

6. Values of Input Modules 1–4 and System Status: Safety Input 1a-4b with Status

This consists of 2 bytes in (Parameters 1–8 and 81)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
In 0	Input 4b Value	Input 4a Value	Input 3b Value	Input 3a Value	Input 2b Value	Input 2a Value	Input 1b Value	Input 1a Value
In 1	System Status	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

7. Semiconductor Output: Reserved

This consists of 1 byte out (Parameter 83)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
In 0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Y34 Output State

8. Values of Input Modules 1-10, System Status and Y34 Output: Safety Input 1a-10b with Y34 Status

This consists of 2 bytes in (Parameters 1–20 and 82), and 1 byte out (Parameter 83)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
In 0	Input 4b Value	Input 4a Value	Input 3b Value	Input 3a Value	Input 2b Value	Input 2a Value	Input 1b Value	Input 1a Value
In 1	Input 8b Value	Input 8a Value	Input 7b Value	Input 7a Value	Input 6b Value	Input 6a Value	Input 5b Value	Input 5a Value
In 2	System Fault	Y34 Output State	Reserved	Reserved	Input 10b Value	Input 10a Value	Input 9b Value	Input 9a Value
Out 0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Y34 Out

9. Values of Input Module 1, System Status and Y34 Output: Safety Input 1a-1b with Y34 Status

This consists of 1 byte in (Parameters 1, 2 and 81), and 1 byte out (Parameter 83)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
In 0	System Fault	Y34 Output State					Input 1b Value	Input 1a Value
Out 0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Y34 Out

10. State of the Output Groups: Group State

This consists of 1 byte in (Parameters 36–38)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
In 0	Reserved	Reserved	Group 3 Active	Group 3 Ready	Group 2 Active	Group 2 Ready	Group 1 Active	Group 1 Ready

11. Value of Input Modules 1-10: Safety Input 1a-10b Values

This consists of 3 bytes in (Parameters 1-20)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
In 0	Input 4b Value	Input 4a Value	Input 3b Value	Input 3a Value	Input 2b Value	Input 2a Value	Input 1b Value	Input 1a Value
In 1	Input 8b Value	Input 8a Value	Input 7b Value	Input 7a Value	Input 6b Value	Input 6a Value	Input 5b Value	Input 5a Value
In 2	Reserved	Reserved	Reserved	Reserved	Input 10b Value	Input 10a Value	Input 9b Value	Input 9a Value

12. Value of Input Modules 1-10 and System Status: Safety Input 1a-10b with Status

This consists of 3 bytes in (Parameters 1-20 and 81)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
In 0	Input 4b Value	Input 4a Value	Input 3b Value	Input 3a Value	Input 2b Value	Input 2a Value	Input 1b Value	Input 1a Value
In 1	Input 8b Value	Input 8a Value	Input 7b Value	Input 7a Value	Input 6b Value	Input 6a Value	Input 5b Value	Input 5a Value
In 2	System Fault	Reserved	Reserved	Reserved	Input 10b Value	Input 10a Value	Input 9b Value	Input 9a Value

Chapter 3: Quick Start Guide

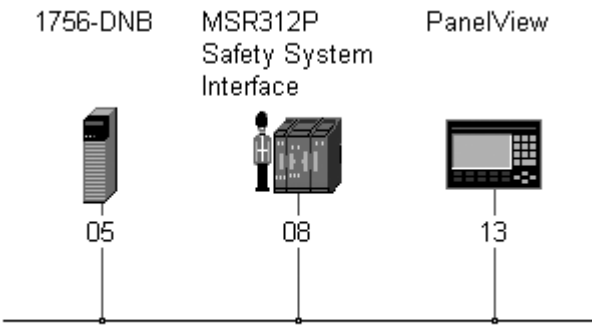
A simple system is setup to demonstrate messaging. The simple system consists of a 1756-DNB, the MSR312P, and a PanelView 1000.

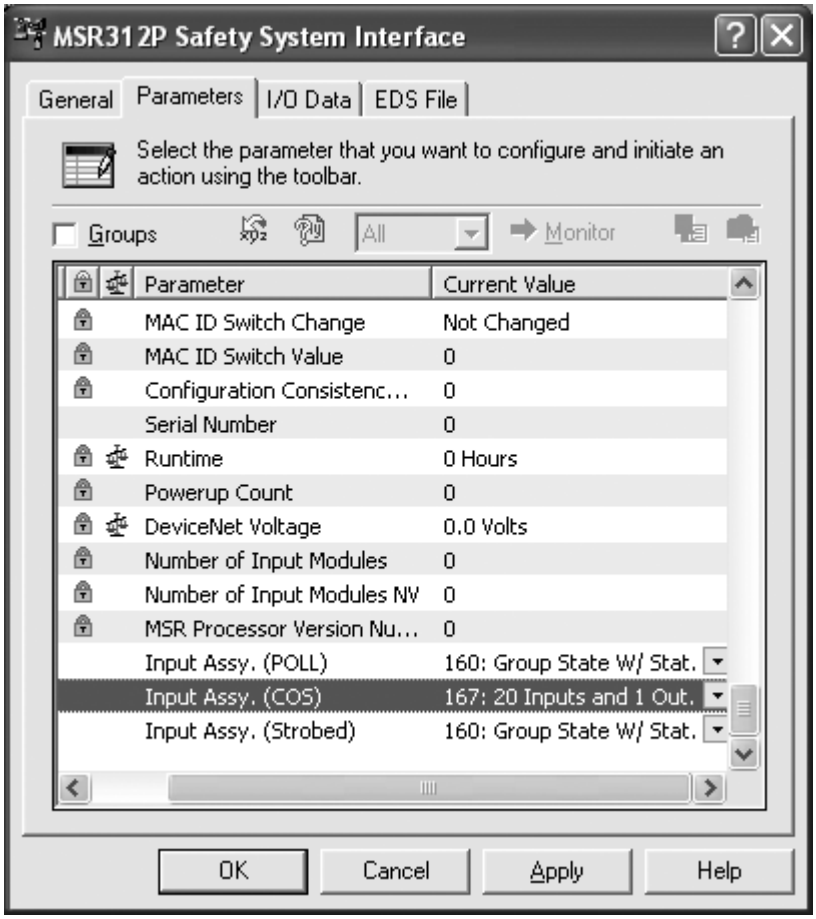
Example 1

Using Change Of State (COS) messaging, the Input Module Values 1-20, the Y34 Output and the System Status will be displayed on the PanelView 1000. This information is located in Option 8 (167) of Parameter Input Assembly (COS).

Step 1. Select “167: 20 inputs and 1 output” (Safety Input 1a-10b with Y34 Status (3bytes))

In the RSNetWorx Graph tab, double click on the MSR312P icon. Click on the Parameters tab, and scroll down to Parameter 104. Click on the “Current Value” cell for Parameter Input Assembly (COS), and the drop down menu will automatically appear. Select the desired option (in this case, 167). If you click on the “parameter help” icon, it will state the number of input and output bytes required for each choice. This will be needed in the next step. Notice it states 2 bytes in, 1 byte out. Click OK. This determines the data that will be sent to the 1756-DNB scanner via the COS connection.

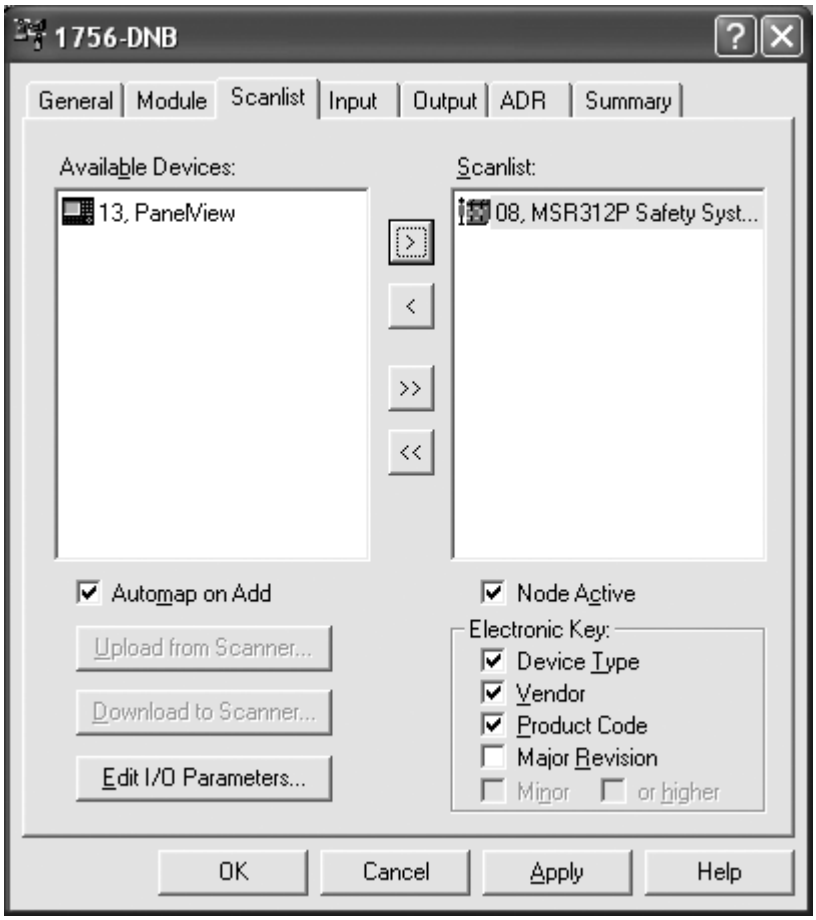




Step 2. Add the MSR312P to the Scan List of DNB scanner.

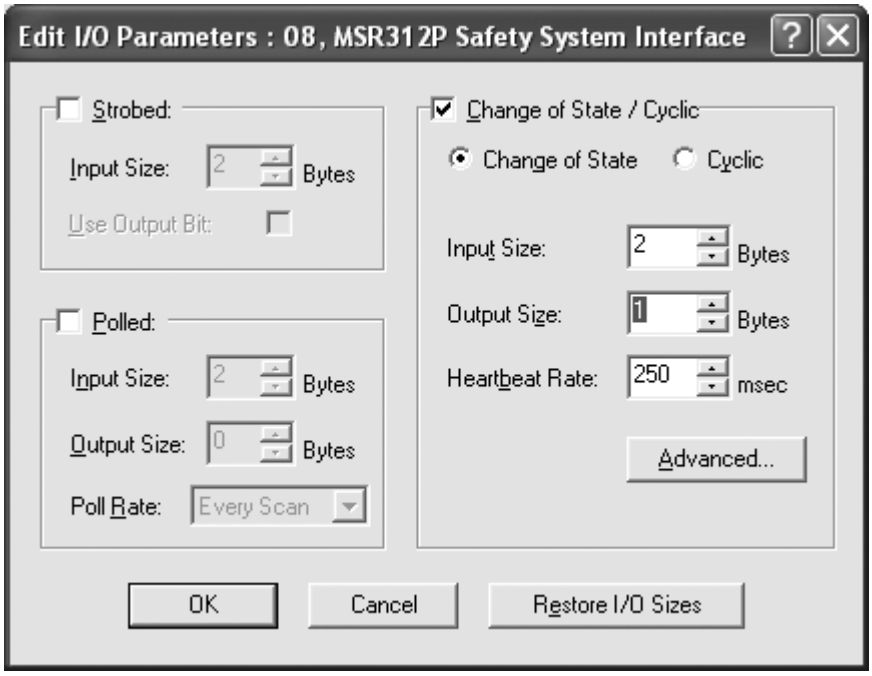
Double-click the 1756-DNB icon. Click on the “Scanlist” tab. Highlight the MSR312P and click the right arrow in the middle of the window to move the MSR312P to the Scanlist.

With the MSR312P still highlighted, click on the Edit I/O Parameters button.



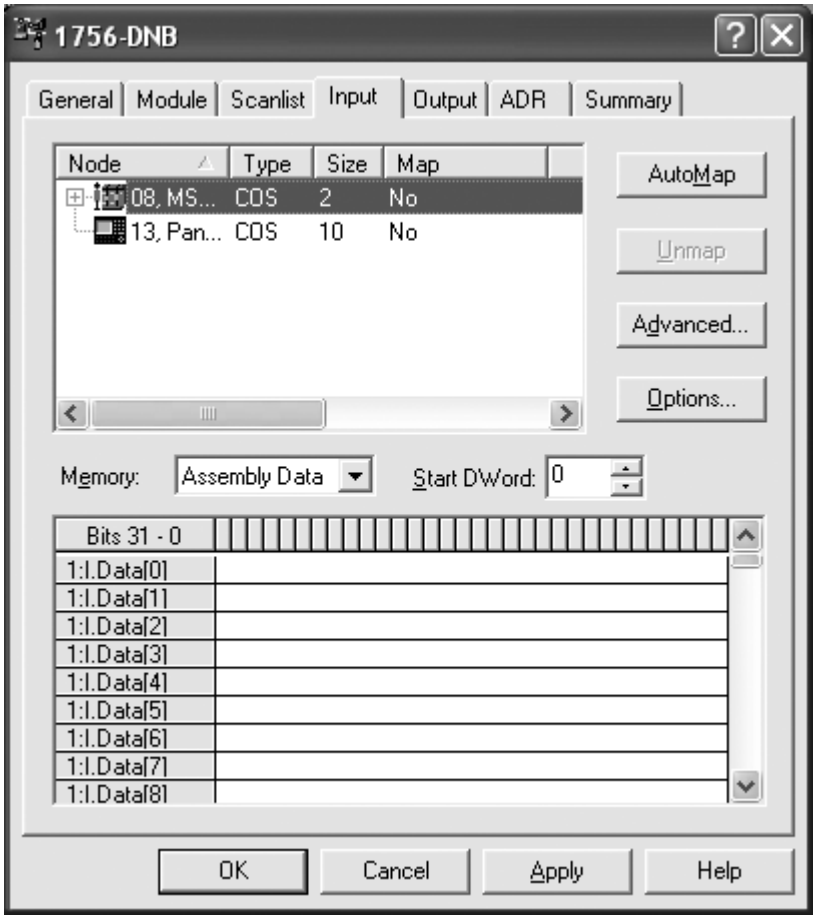
Step 3. Set up I/O parameters for the MSR312P.

Verify the Strobed and Polled boxes are unchecked. Check the “Change of State/Cyclic” box. Set the Input Size to 2 and the Output Size to 1. We knew the I/O sizes from the parameter help within the MSR312P Parameter (103, 104, 105). Select an appropriate Heartbeat Rate. (Default is ok) Click OK.



Step 4. Configure the MSR312P Inputs.

Click on the “Input” Tab. The software automatically maps the Input data at the first available memory locations. Same as selecting “Automap.” Let’s change the location of the data to start at word 10 instead of the default of word 0. Highlight the MSR312P and click Advanced.



Step 5. Map the MSR312P Inputs.

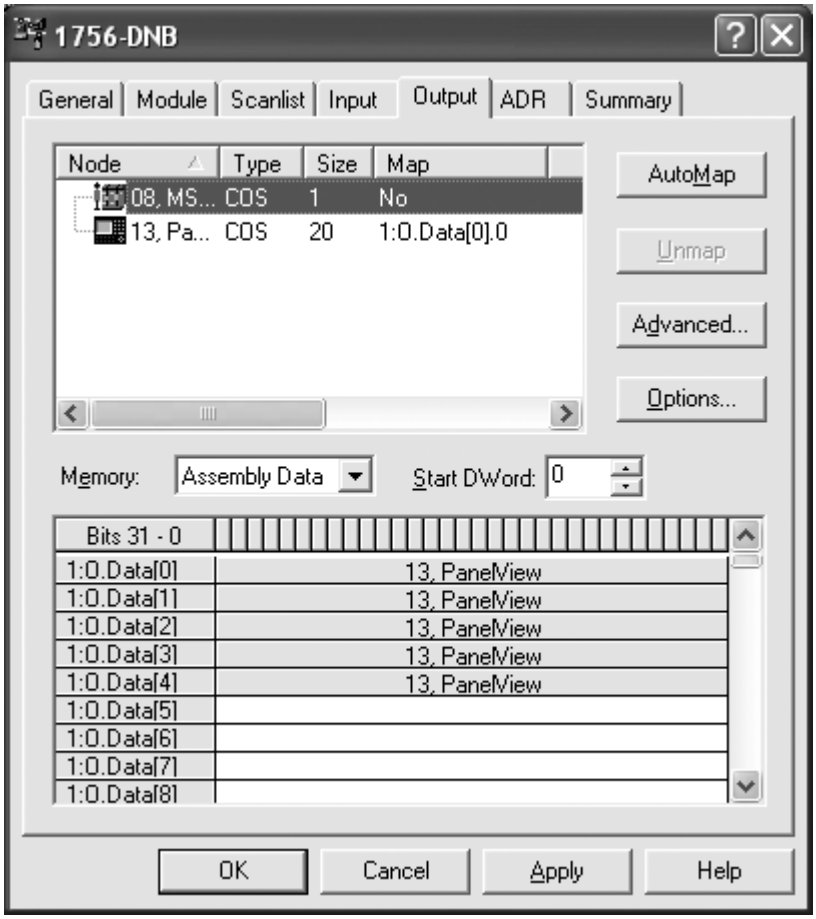
In the “Map From:” box, set the Message value to COS. In the “Map To:” box, set the DWord value to 10. This value will be used in the ladder logic program to place the values into the proper memory location.

If AutoMap was selected on the previous screen, then the user must adjust the ladder logic program to the appropriate memory location.

Click “Apply Mapping” and then close the window.

Step 6. Configure the MSR312P Outputs.

Click on the “Output” Tab. The software automatically maps the Output data at the first available memory locations. Same as selecting “Automap.” Let’s change the location of the data to start at word 10 instead of the default of word 0. Highlight the MSR312P and click Advanced.



Step 7. Map the MSR312P Outputs

In the “Map From:” box, set the Message value to COS. In the “Map To:” box, set the DWord value to 10. This value will be used in the ladder logic program to place the values into the proper memory location.

If AutoMap was selected on the previous screen, then the user must adjust the ladder logic program to the appropriate memory location.

Click “Apply Mapping” and then close the window.

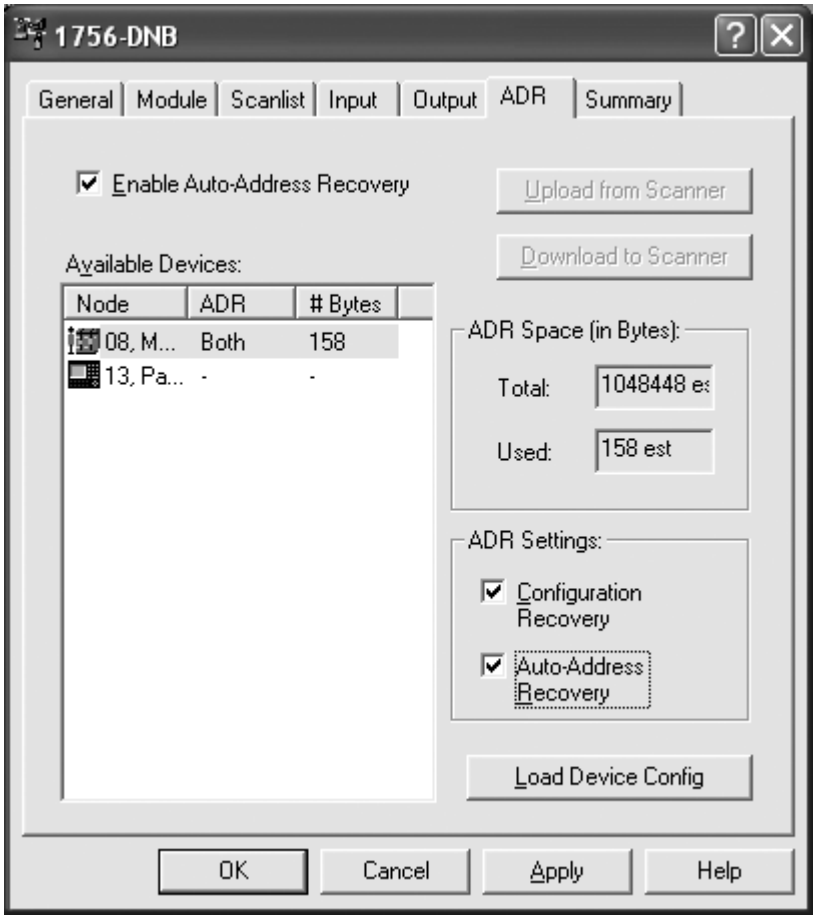
Step 8. Configure Auto Device Replacement (ADR).

To view/edit the auto device replacement parameters, click the **ADR** tab. Select the “Enable Auto-Address Recovery” box. Click *Load Device Config*. Select “Configuration Recovery” and “Auto Address Recovery.”

ADR is helpful when a unit fails due to mechanical or internal damage and it needs to be replaced. Without any software tool, the unit can be replaced with a brand new device and the 1756-DNB scanner will recognize the change and reprogram the node address and configuration information of the new device to the same parameters as the original device.

Note: Be sure you have completely setup the MSR312P first and no additional changes to the unit will be required. When ADR is enabled, the configuration information can not be saved into the device.

Note: If the MAC ID is set through the rotary switches, auto-address recovery will not be available for use. This option requires the ability to reprogram the MAC ID, therefore, it must be software programmable.



For more information on scanner configuration, refer to the *DeviceNet Scanner Configuration Manual* (Publication 1756-6.5.15) for the ControlLogix platform.

This completes the configuration needed to setup the MSR312P within the 1756-DNB scanner.

Note: If Parameter Input Assembly (COS), in this example had different I/O data (other than 167) the “Edit I/O Parameters” settings would also be different. If a Polled I/O or Cyclic I/O was desired instead, using parameters Input Assembly Poll or Strobe, the size of the data would not change but the scanner would need to be updated with “Polled” or “Cyclic” instead of the “COS” used in this example.

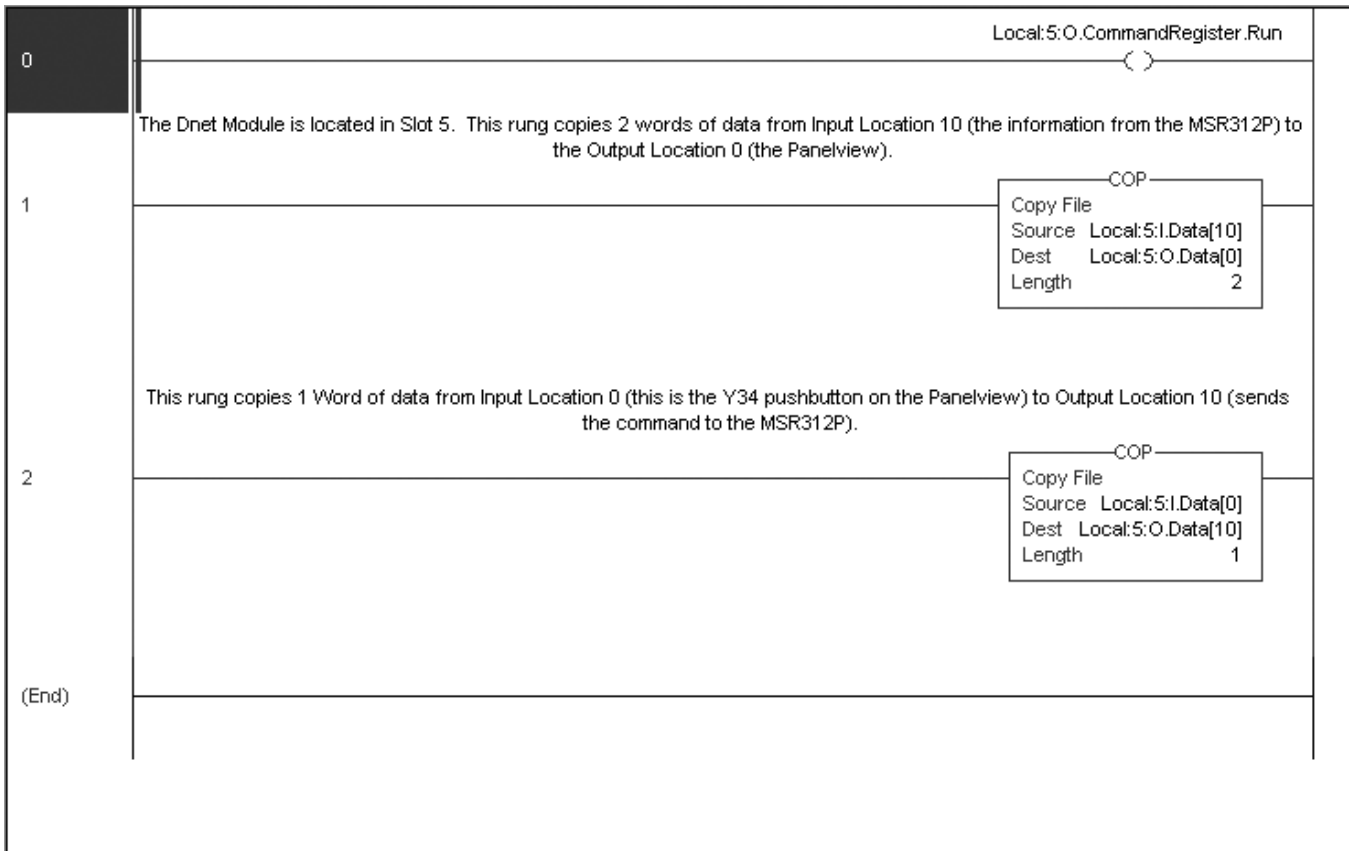
Step 9. Configure the Panelview 1000 I/O data.

Repeat steps 2-7 for the Panelview 1000. Make sure the Panelview icon is selected within the 1756-DNB module then repeat the same steps. In this example the panelview is configured with 20 words within the 1756-DNB scanner. The I/O data is located from Dword 0 for both the input and output data. These are the default (Automap) locations.

Step 10. Set up the Ladder Logic Program.

A simple ladder logic program transfers the information back and forth between the MSR312P and the PanelView 1000.

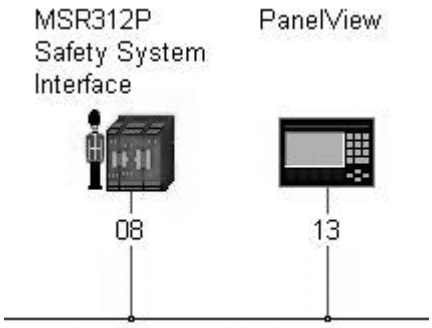
The address of the Source and Destination must match the addresses set in the 1756-DNB input and output mapping in the previous steps.


0
Local:5:O.CommandRegister.Run
The Dnet Module is located in Slot 5. This rung copies 2 words of data from Input Location 10 (the information from the MSR312P) to the Output Location 0 (the Panelview).
1
COP
Copy File
Source Local:5:I.Data[10]
Dest Local:5:O.Data[0]
Length 2
This rung copies 1 Word of data from Input Location 0 (this is the Y34 pushbutton on the Panelview) to Output Location 10 (sends the command to the MSR312P).
2
COP
Copy File
Source Local:5:I.Data[0]
Dest Local:5:O.Data[10]
Length 1
(End)

Example 2 — Explicit Messaging (UCMM)

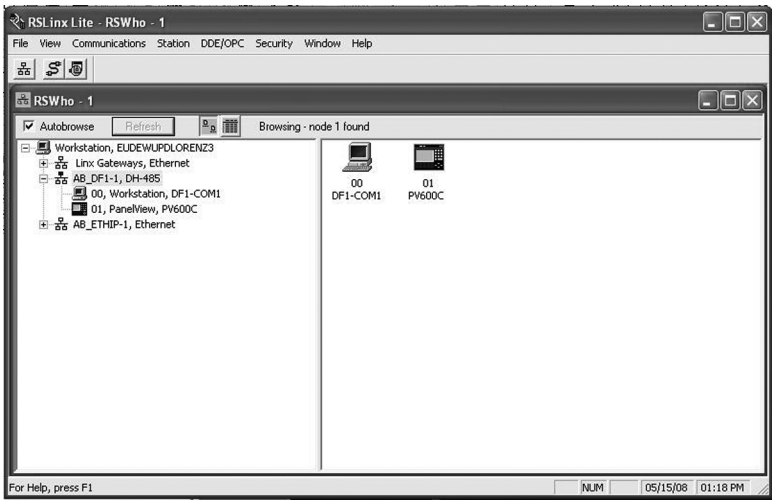
This example requires a PanelView providing Explicit Messaging and MSR312P Series B. In this case, we are using a PanelView 600 Touch. To configure communication and Indication Panel Builder 32 needs to be installed.

Please note that the PanelView must not have the same address like the MSR312P



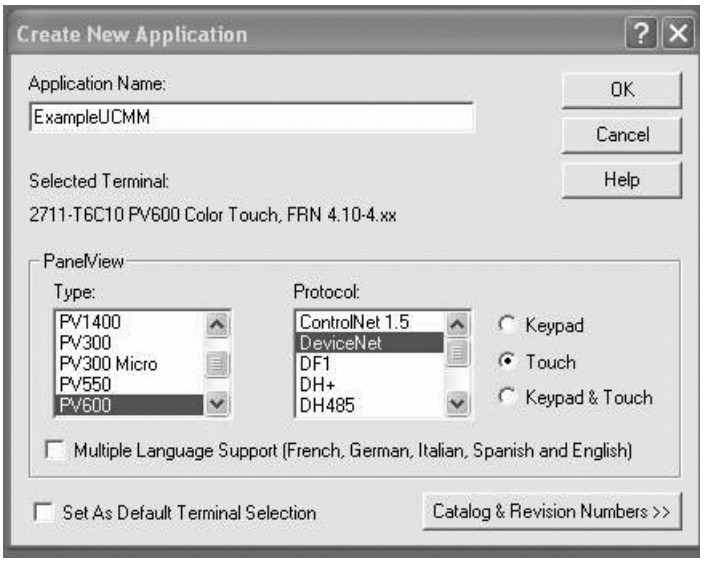
Step 1. Setup PanelView - PC connection.

After the devices have been physically installed open RSLinx to setup connection to PanelView. Click the "Refresh" button to update the node list.



Step 2. Create PanelView project.

Open Panel Builder to configure the PanelView 600 Touch (PV600) for DeviceNet. Click "New Project" and select "Creat a new application" to open the configuration dialog box.



Name the project and choose the appropriate PanelView in the "Type" list. Highlight DeviceNet to enable the PV600 Touch for DeviceNet communications and confirm your configuration by clicking "OK".

For more information on PanelView configuration, refer to the Panel ViewManual (Publication 6556-5.8).

The PanelView connections to other devices are created using addresses in the Tag Form dialog or Tag Editor.

For Read Tags: PanelView (client) initiates communications with Explicit "Get" message to obtain input data from the MSR312P (Server). The MSR312P responds by sending data.

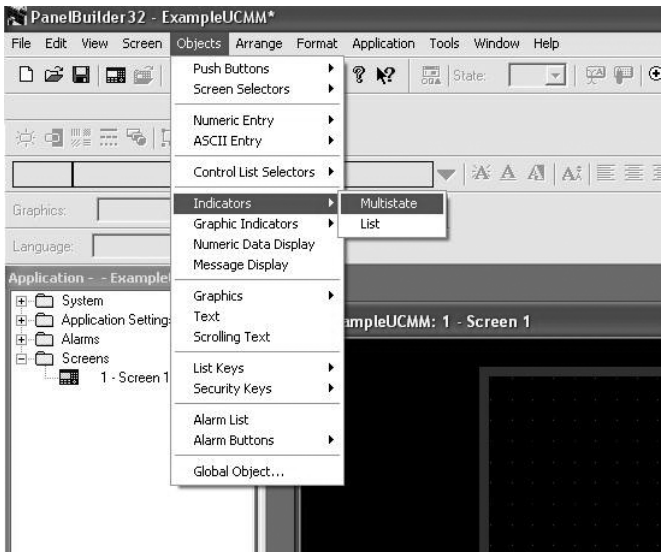
For Outputs: PanelView (Client) device sends data using Explicit "Set" Message to set output data. The MSR312P responds that data has been received.

Note: Only **Get_Attribute_Single** and **Set_Attribute_Single** commands are supported. For PanelView objects with Explicit Client addressing:

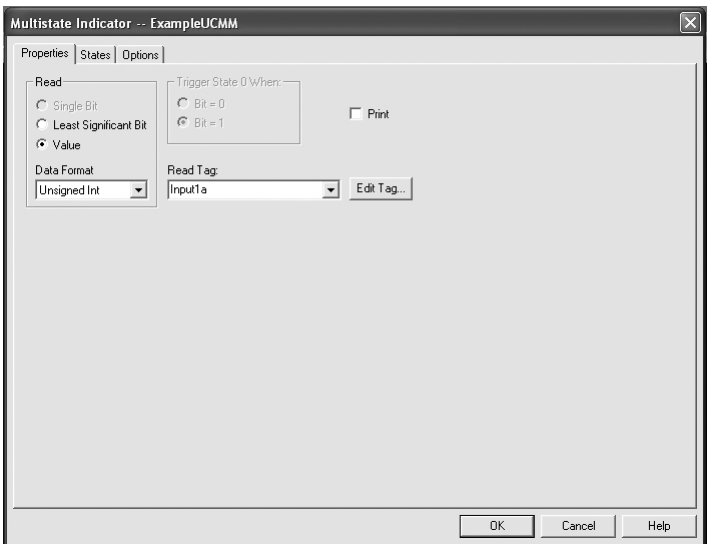
- **Get_Attribute_Single:** The PanelView sequentially scans values addressed to PanelView objects in the current screen (or global objects) and reads data from the external server device.
- **Set_Attribute_Single:** The PanelView sends values to the external device when a change of state is detected on that input.

Step 3. Using Read Tag to indicate Input1a state.

It is intended to display the Input 1 status of the First MSR320 Input module (Input 1a). For this a Multistate Indicator Object is used as a Read Tag Select "Indicators" within the "Objects" menu and then "Multistate" to insert the indicator box into the Panel View screen.



A double click on the Indicator box within the screen opens the dialog to configure the Tag.



Click "Edit Tag…" to configure the Read Tag and connection. Verify if the "Value" box is checked. The Read Tag "Data Format" should be the same as Parameters data size configured in the "Tag Form" dialog.

The Tag must be configured according to its description within the EDS-File. To indicate "Input1a" Parameter 1 is used. (refer to Parameter description).

The EDS-File defines Parameter 1 as follows:

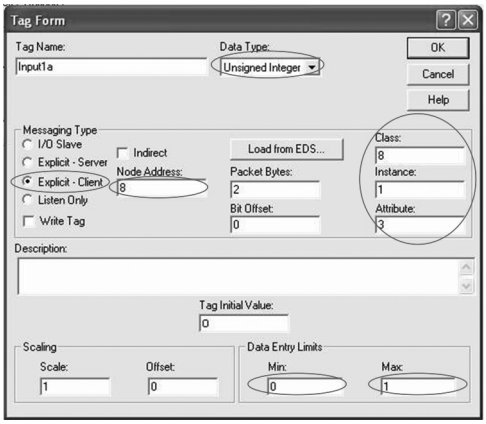
```
Param1=  Class Instance  Attribute
    0,
    6, "20 08 24 01 30 03",                  $ DIG Vender Defined Attribute Instance 1
    0x12,
    0xC1, 1,        Size in Byte
    "Input 1a Value",                        $ 1 Byte
    " ",                                     $ No Units
    "This parameter indicates the value of the input. An value of 'Off' \n"
    "indicates that this input is not active. There are myriad reasons \n"
    "this may occur: an operator may have intentionally triggered the \n"
    "attached device (such as by releasing a two-hand control or stepping \n"
    "on a safety mat), an offwire condition may have been created \n"
    "in which a wire has physically fallen off the input, the device may \n"
    "have been removed from the channel, or the simultaneity monitoring \n"
    "time limit (if enabled) may have been exceeded. \n",
    0,1,0,      Min, Max value               $ min, max, default values
    1,1,1,0,
    0,0,0,0,                                 $ mult, div, base, offset links default to 0
xxxx1xxx in descriptor
    0;

Enum1=          Data Range
    0, "Off";
    1, "On";
```

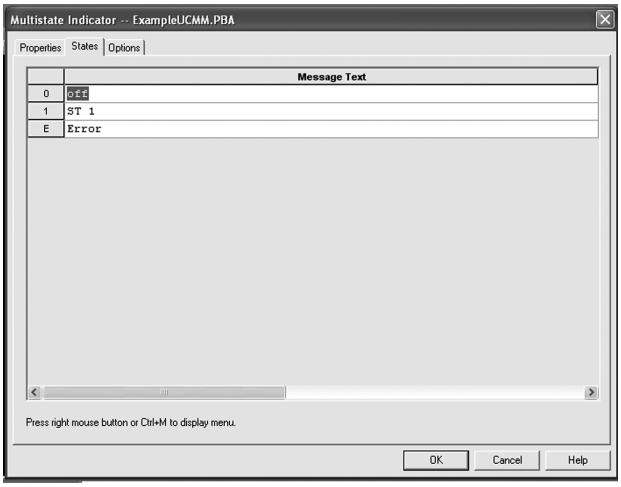
Enter the "Tag Name", in this case "Input1a" and select "Unsigned Integer"(=1 byte) for the "Data Type" according to the parameter size in byte mentioned in the EDS.

Check the "Explicit - Client" (Panel iew = Client) box and enter the MSR312P (server) node address.

The "Packet Bytes" are set to "2" per default for Read Tags. Enter the "class", "Instance" and "Attribute" value to address "Parameter 1". The "Data Entry Limits" needs to match the appropriate Min, Max values of the EDS.

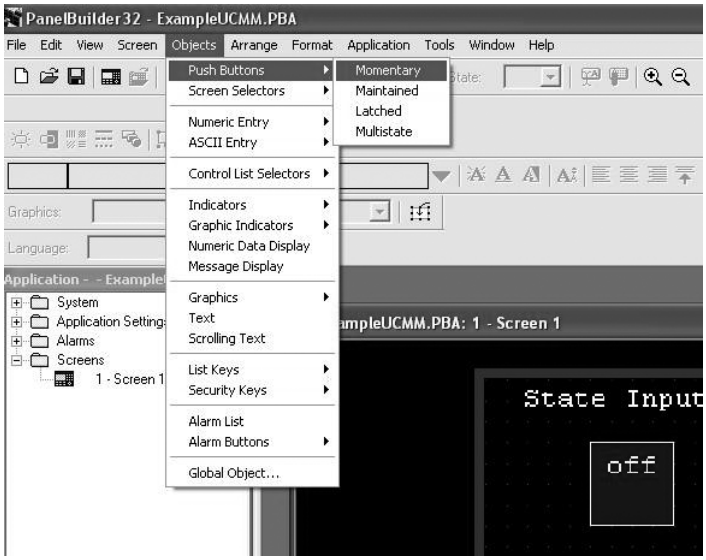


Confirm your configuration with "OK" and define the Indicator's message text in "States" register.



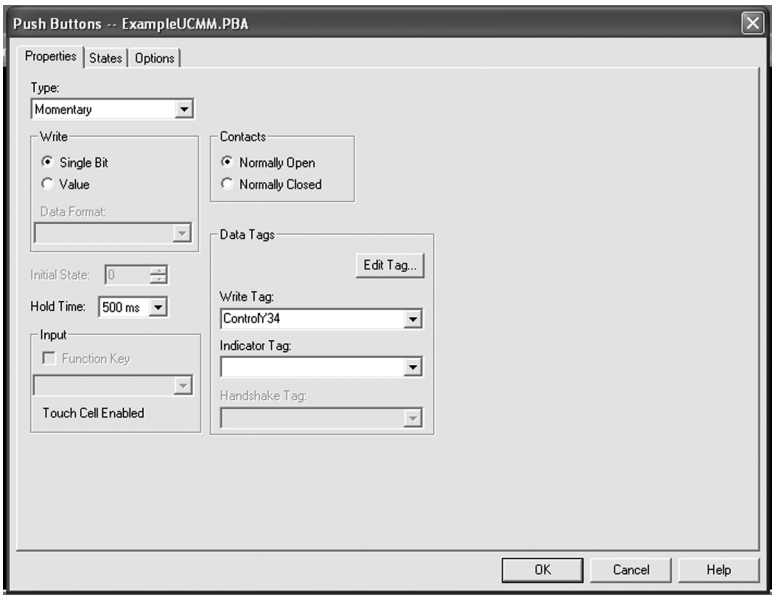
Step 4. Using Write Tag to set Semiconductor Output Y34.

The Y34 Parameters (Parameter 83-88) are partly configurable (refer to Parameter description). Its output state can be set by using Parameter 83. Therefore a "Momentary" "Push Buttons" Object is added to the Project.

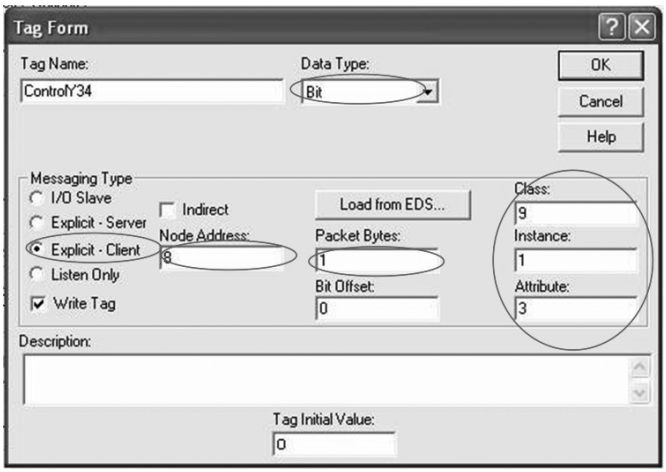


Open the Tag Form as described in Step 3. The PanelView 600 Touch provides the functionality to configure objects to simulate a switching device by triggering the object on the screen. The selected Push Button is configured as follows:

Type: Momentary
Contacts: NO
Hold Time: 500ms (Default)



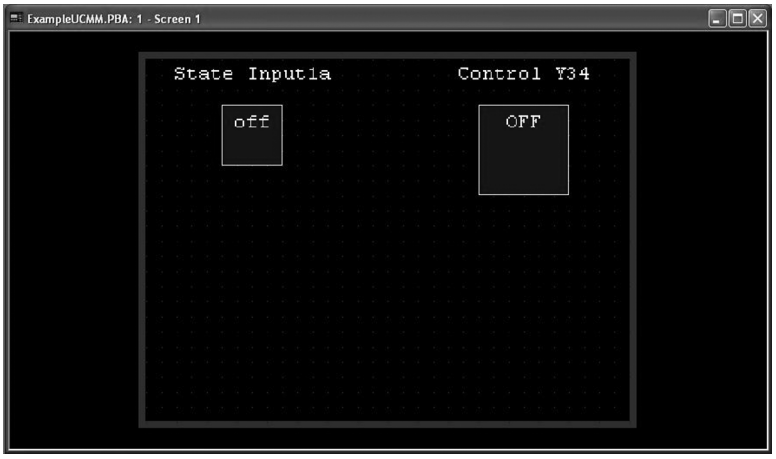
Verify if the "Single Bit" box is checked and click "Edit Tag…" to configure the communication in the Tag Form Dialog.



Select Messaging Type and node address as described in Step 3 and check the "Write Tag" box. Class, Instance and Attribute are derived from the EDS file Parameter 83 description. Select "Bit" for "Data Type" and enter "1" for "Packet Bytes".

Click "OK" and set the Message Text in the "States" register.

The resulting PanelView screen looks as follows:



Finally download the application to the Panel View.

Step 5. Start Messaging.

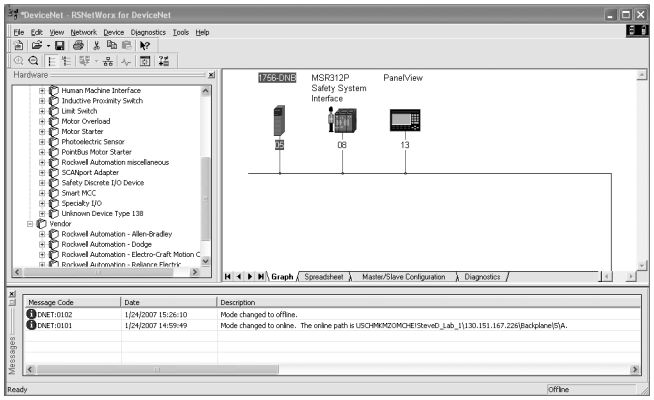
Connect MSR312P and PanelView via DeviceNet and power the bus.

The state of Input 1 on the first MSR320 input module should now be displayed with the "State Input1a" Object on the PanelView screen. Pushing the screen element configured to control Y34 should activate the semiconductor output (24V).

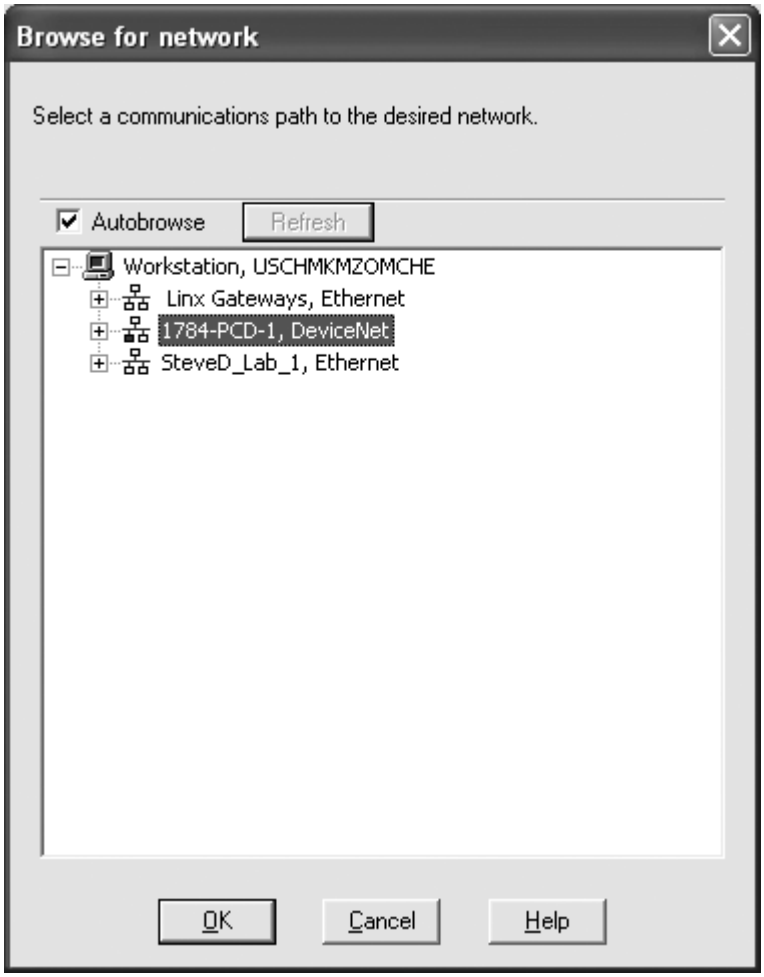
Note: For this to work correctly the output Y34 can not be owned by the PLC. So, the PLC can only use strobed. A conflict in ownership of Y34 will cause an error on the PLC or PanelView depending on who acquired the connection first.

Chapter 4: Getting Online via RSNetWorx™ for DeviceNet™

After connecting the MSR312P to the DeviceNet network, Open RSNetWorx for DeviceNet. Click “Network” then Select “Online.”

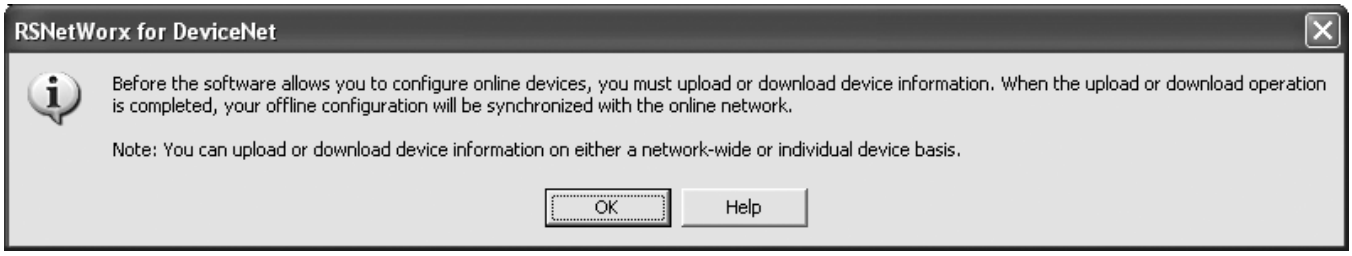


Select the communication path.

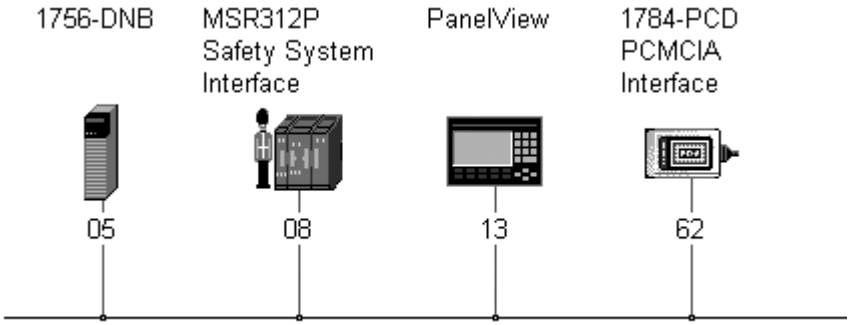


Note: You must configure RSlinx first.

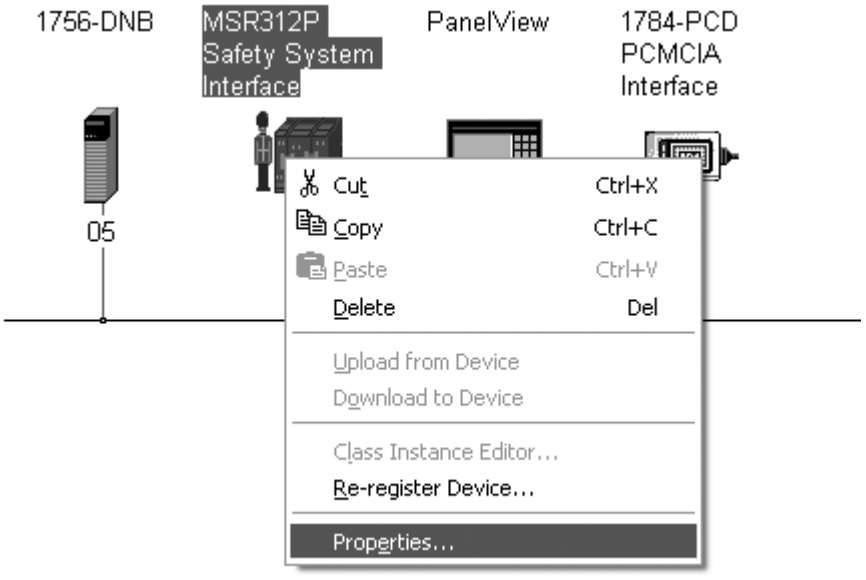
RSNetWorx requests you to synchronize your offline configuration with the online devices. Click OK.


RSNetWorx for DeviceNet
Before the software allows you to configure online devices, you must upload or download device information. When the upload or download operation is completed, your offline configuration will be synchronized with the online network.
Note: You can upload or download device information on either a network-wide or individual device basis.
OK
Help

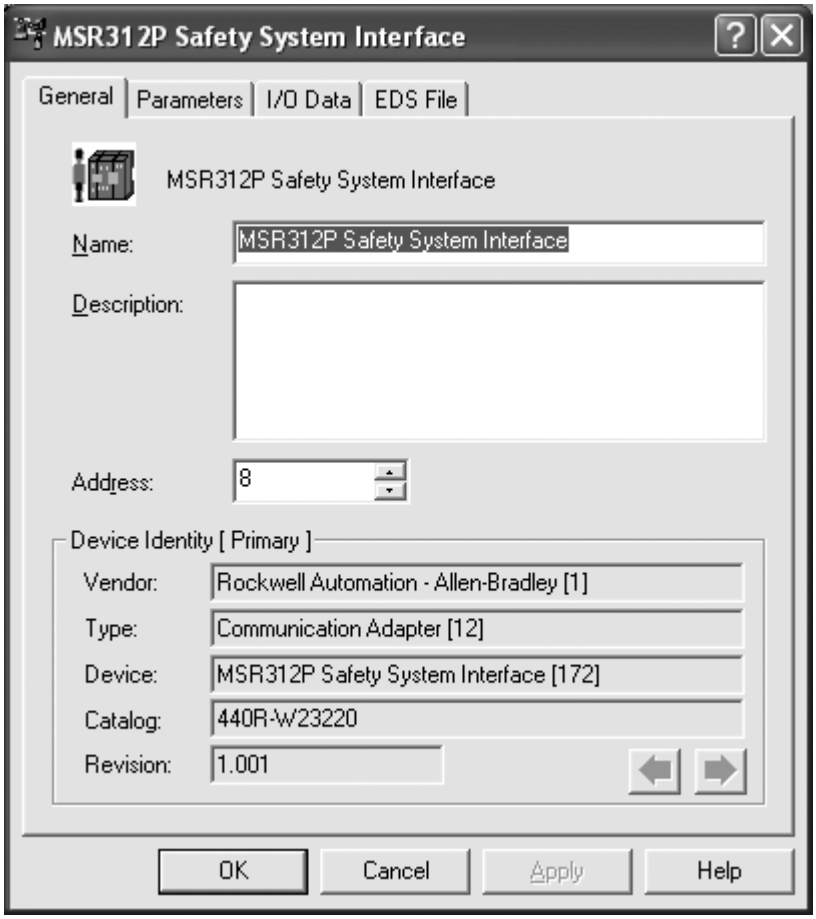
Upon successful completion, the devices on the network appear with their description and node address. The MSR312P, in this case, has address 08.



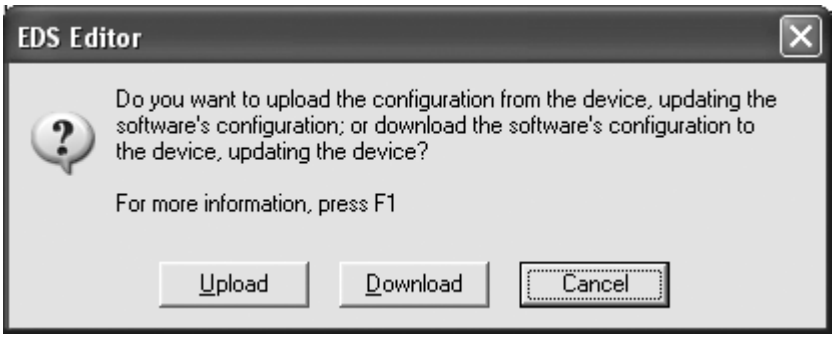
Right click on the MSR312P, and select Properties.



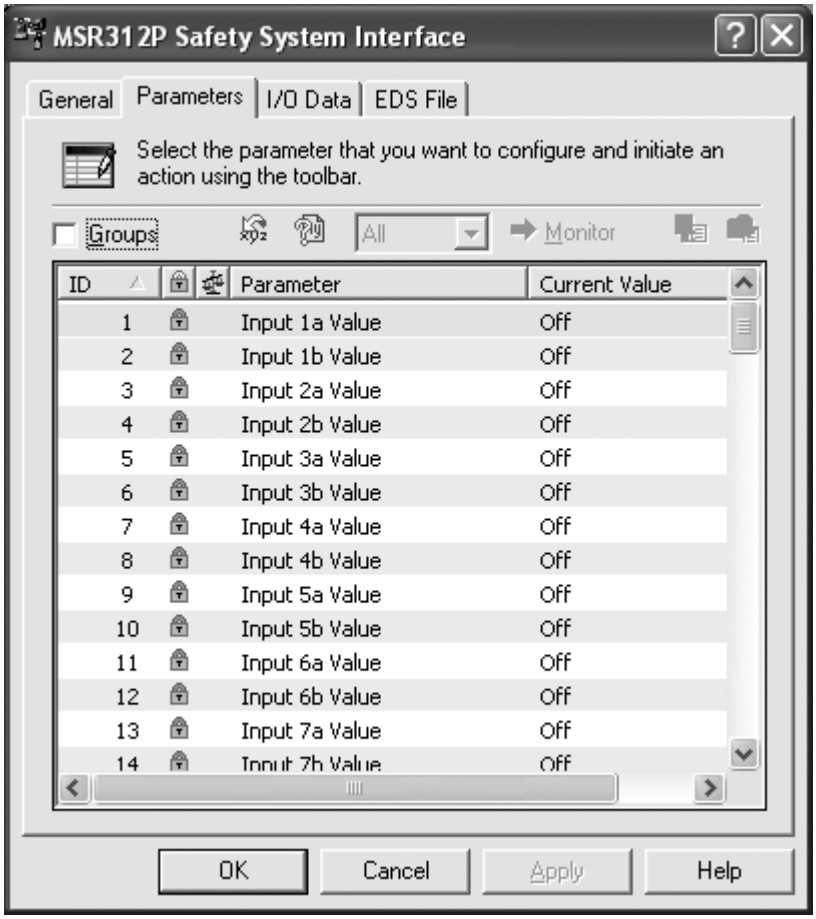
The General properties of the MSR312P are shown. This window allows the viewing the individual parameters, the I/O data and the EDS file.



Click on the parameter tab. The EDS Editor window appears. Click upload to read the current status of the MSR312P.

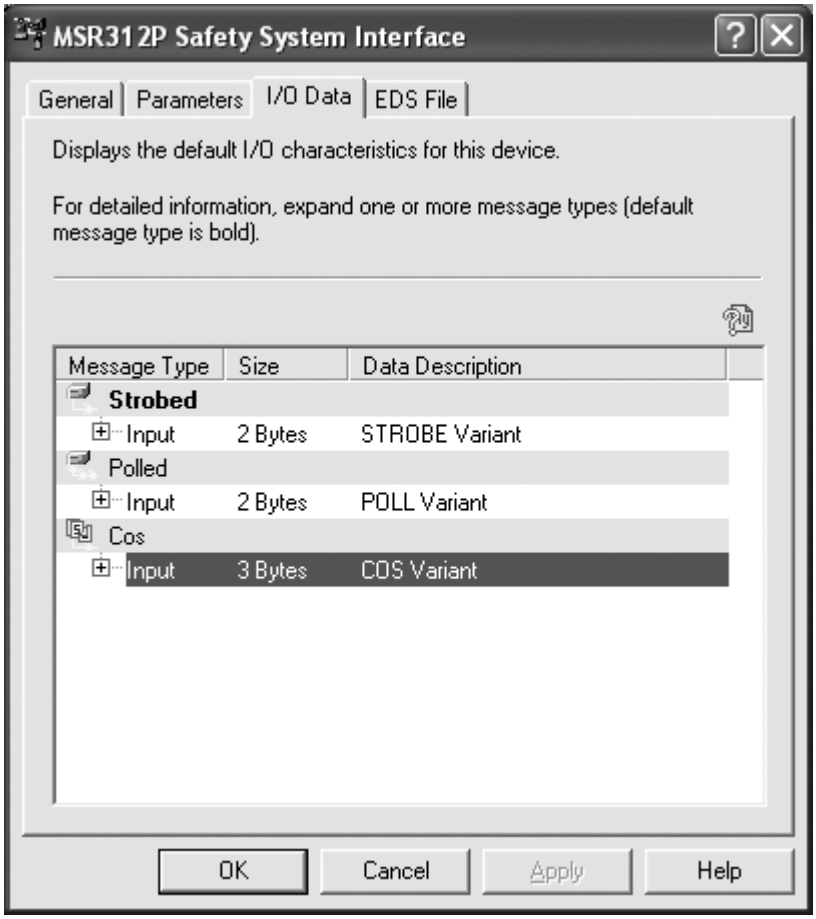

EDS Editor
Do you want to upload the configuration from the device, updating the software's configuration; or download the software's configuration to the device, updating the device?
For more information, press F1
Upload
Download
Cancel

RSNetWorx reads in all the parameters, and then displays them. The window shows the first 14 parameters.

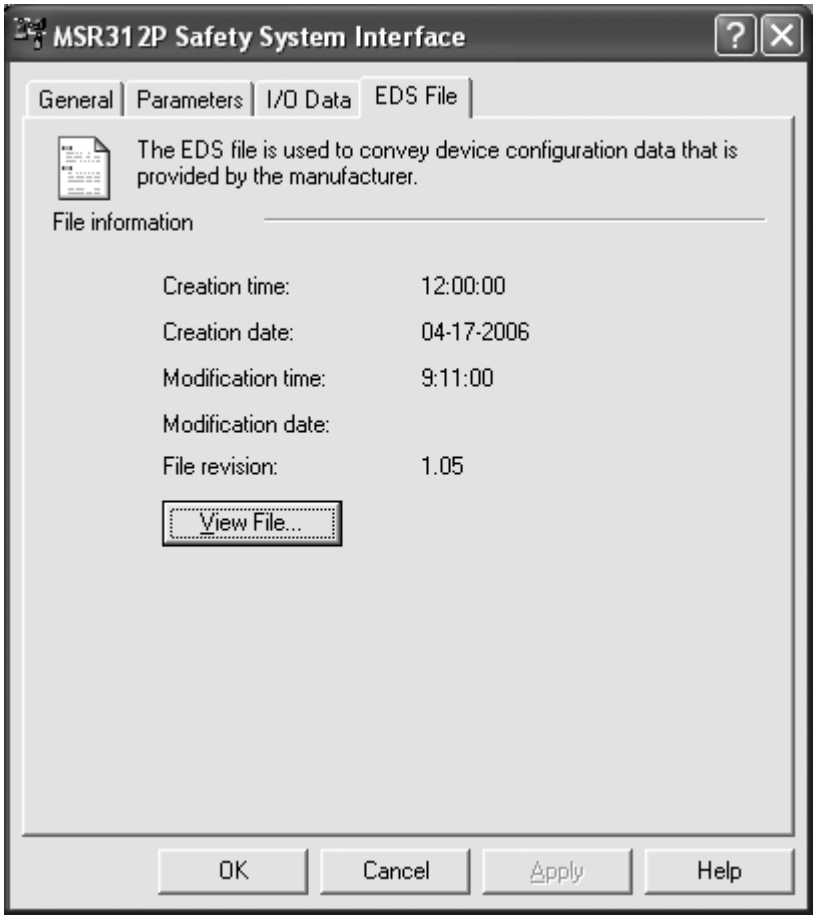


Click on Monitor to continuously update the values of each parameter. When active, the Monitor field will be a white background and an arrow will scroll down the left side.

Click on the I/O tab. The current message type is shown in bold. In this example, Strobed messaging is active.



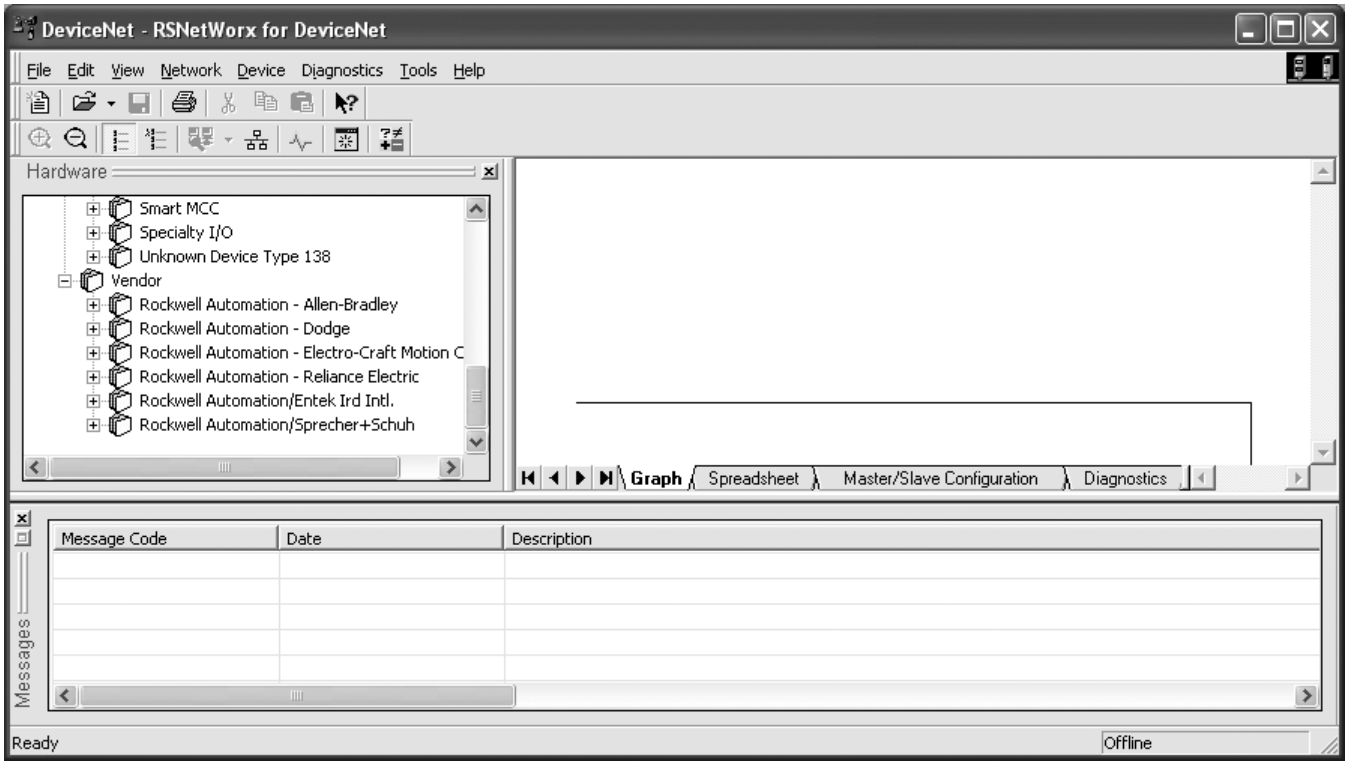
Click on the EDS tab. This tab provides the EDS file revision information. Use the View File button to view the contents of the EDS file.

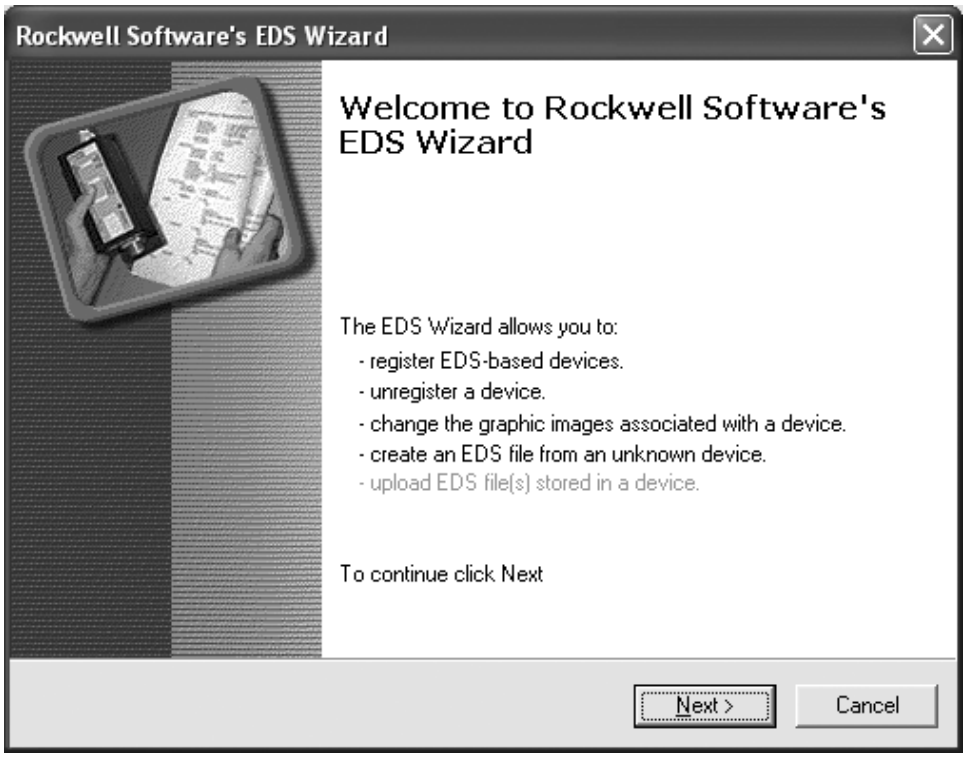

MSR312P Safety System Interface
General
Parameters
I/O Data
EDS File
The EDS file is used to convey device configuration data that is provided by the manufacturer.
File information
Creation time:
12:00:00
Creation date:
04-17-2006
Modification time:
9:11:00
Modification date:
File revision:
1.05
View File...
OK
Cancel
Apply
Help

Chapter 5: Unregister the EDS File

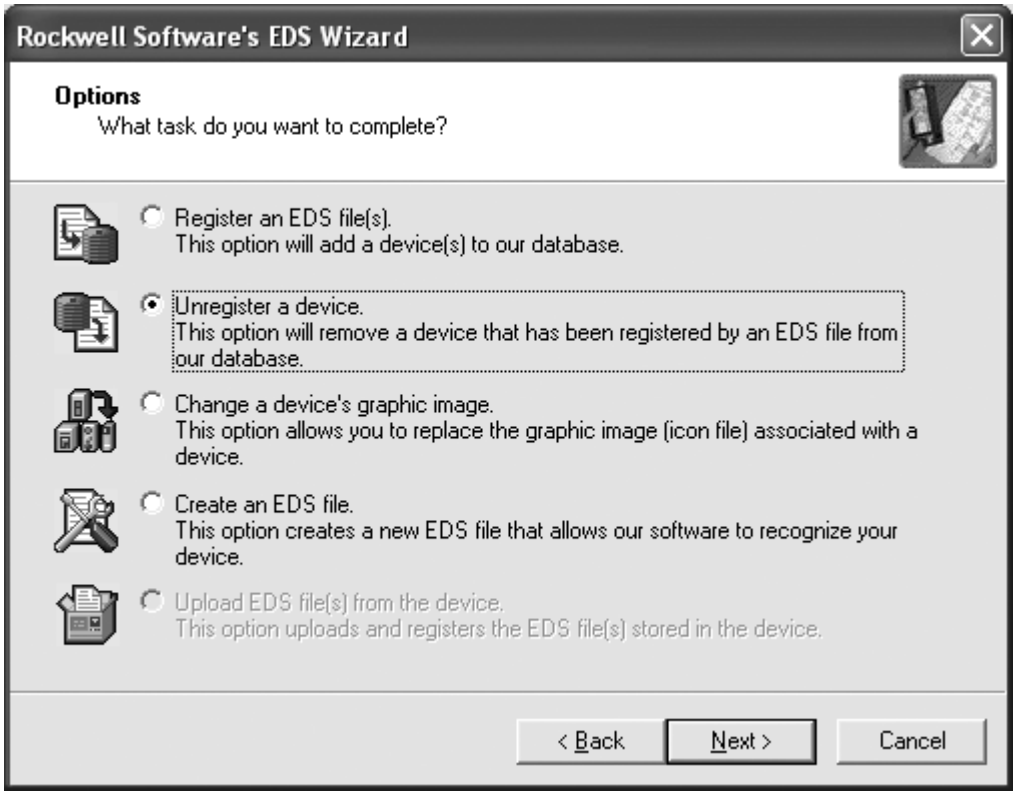
Unregistering the EDS file is only required if the wrong file has been registered. This is not typically required. Close RSlinx if it is already open.

Click on tools in RSNetWorx and select EDS Wizard.

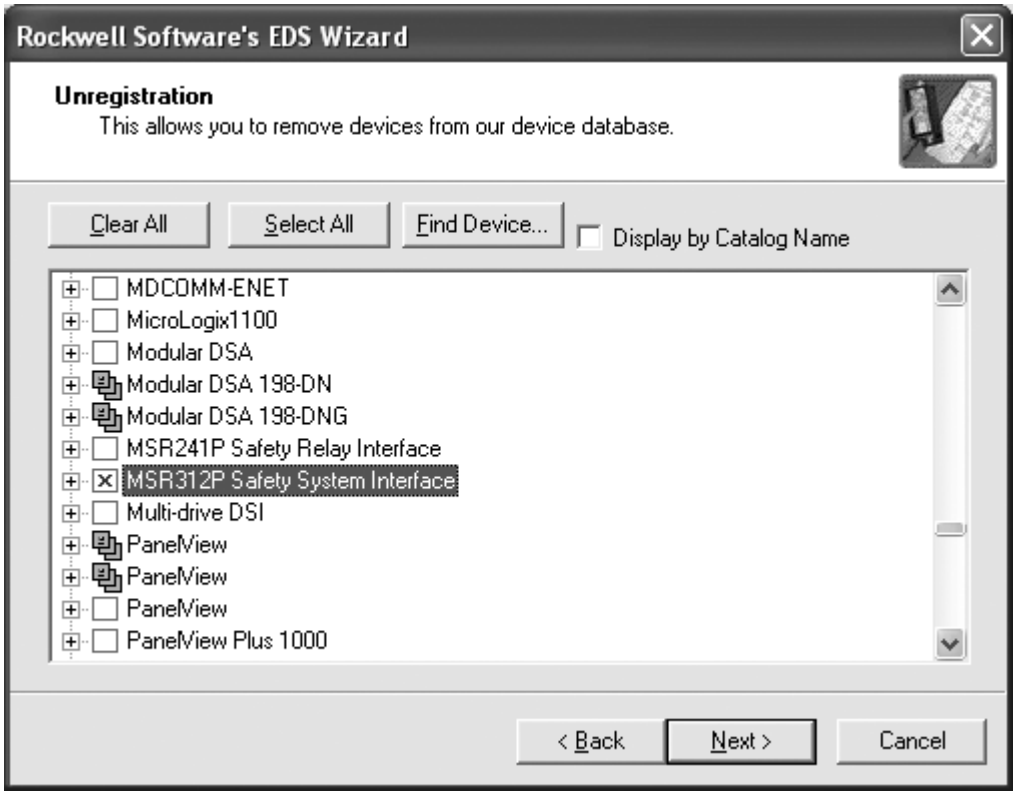



Rockwell Software's EDS Wizard
Welcome to Rockwell Software's EDS Wizard
The EDS Wizard allows you to:
- register EDS-based devices.
- unregister a device.
- change the graphic images associated with a device.
- create an EDS file from an unknown device.
- upload EDS file(s) stored in a device.
To continue click Next
Next >
Cancel

Click “Next.”


Rockwell Software's EDS Wizard
Options
What task do you want to complete?
Register an EDS file(s).
This option will add a device(s) to our database.
Unregister a device.
This option will remove a device that has been registered by an EDS file from our database.
Change a device's graphic image.
This option allows you to replace the graphic image (icon file) associated with a device.
Create an EDS file.
This option creates a new EDS file that allows our software to recognize your device.
Upload EDS file(s) from the device.
This option uploads and registers the EDS file(s) stored in the device.
< Back
Next >
Cancel

Check “Unregister a device” if replacing an older version of the EDS file. Click “Next.”



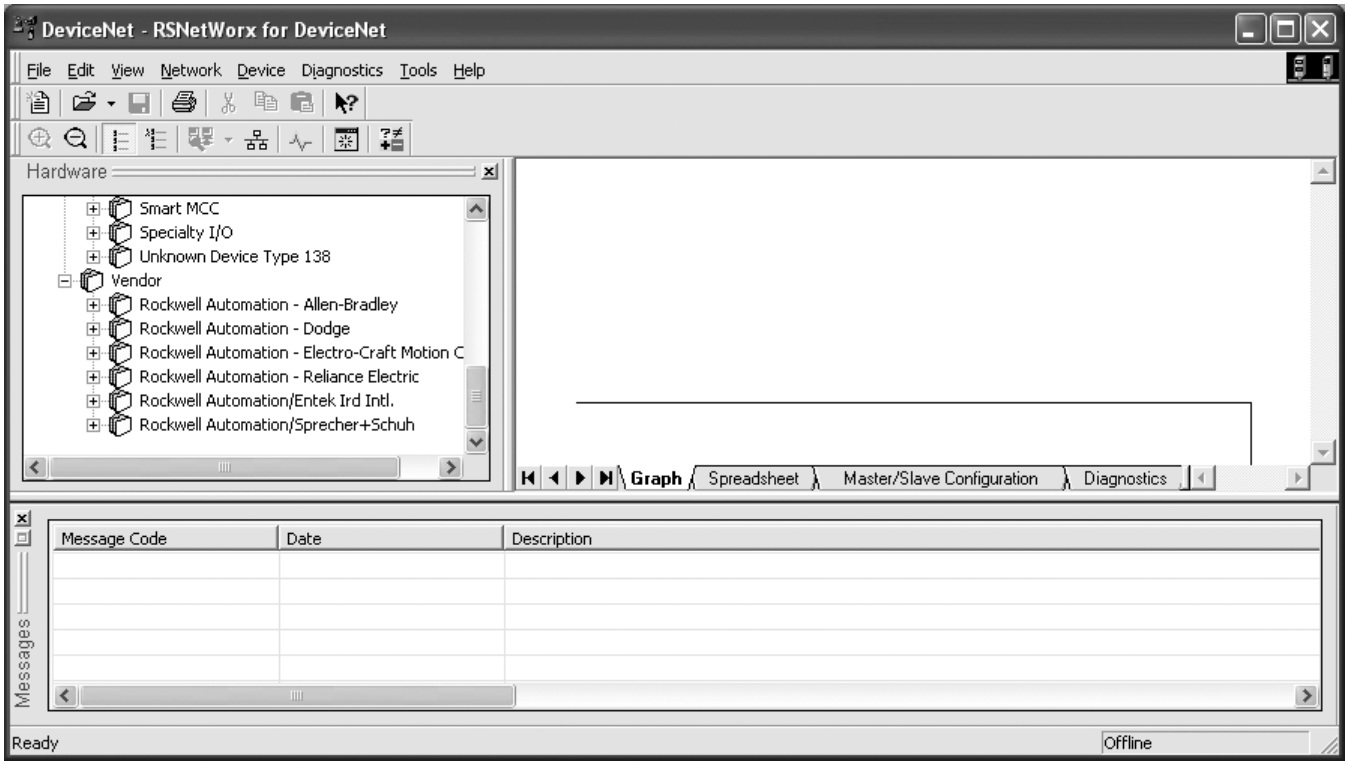
Click “Next.”

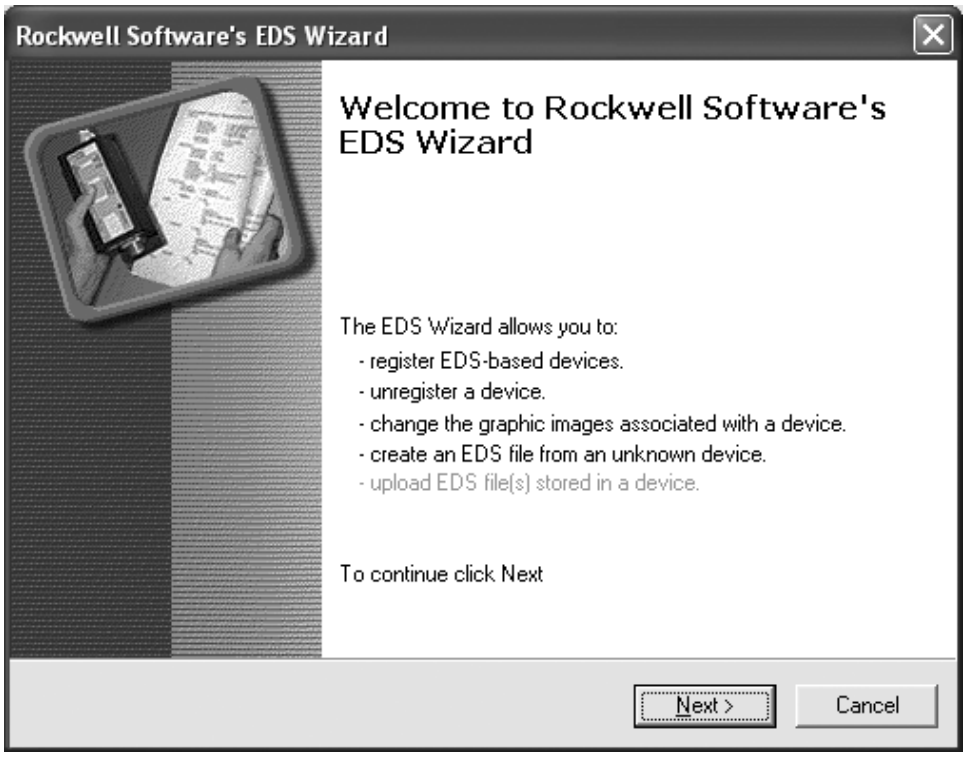
Click “Next” to unregister the device.

Click Finish.

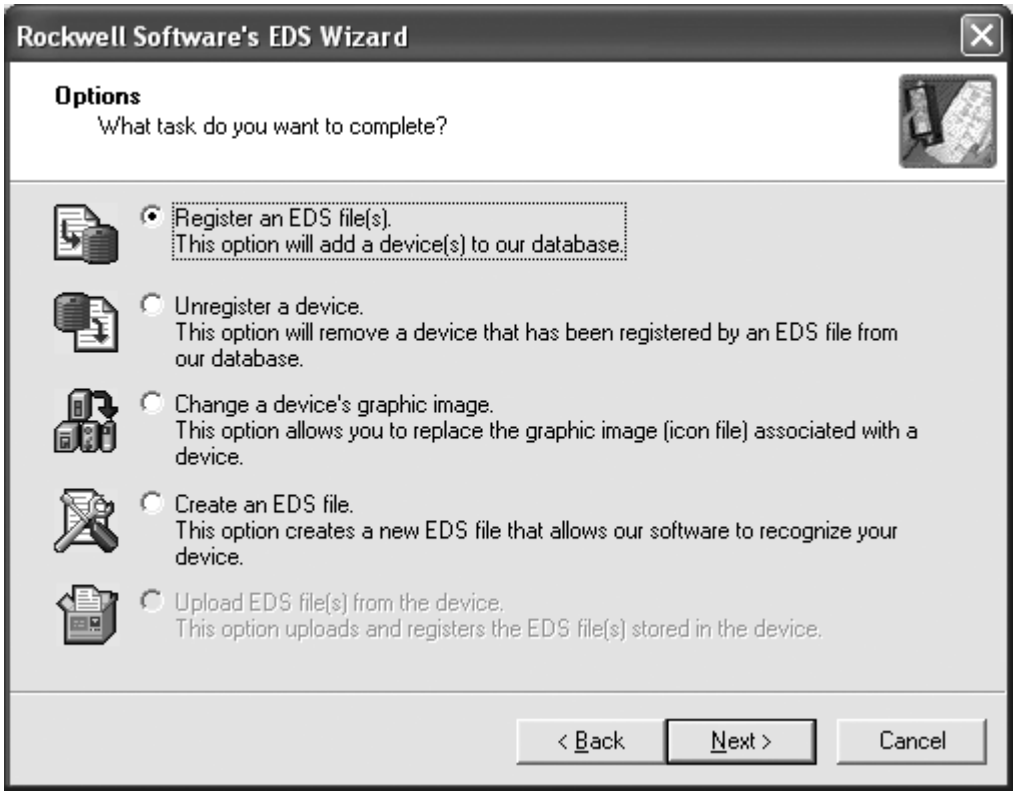
Chapter 6: Register the MSR312P EDS Device

Open the EDS Wizard.

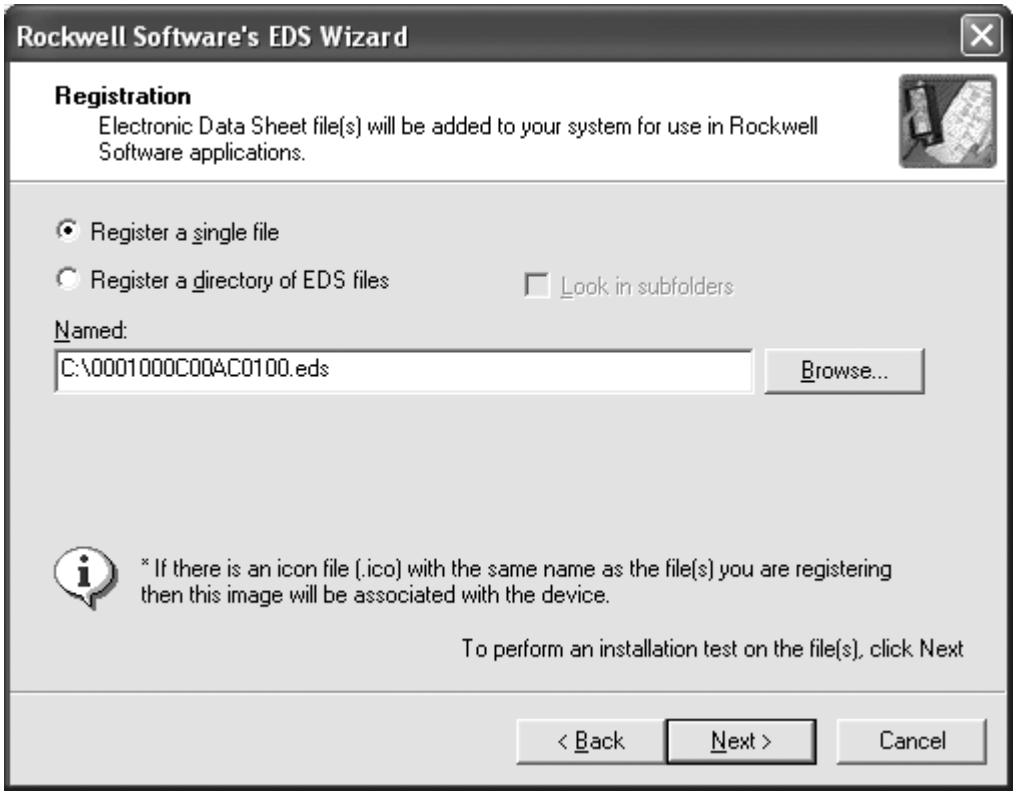



Rockwell Software's EDS Wizard
Welcome to Rockwell Software's EDS Wizard
The EDS Wizard allows you to:
- register EDS-based devices.
- unregister a device.
- change the graphic images associated with a device.
- create an EDS file from an unknown device.
- upload EDS file(s) stored in a device.
To continue click Next
Next >
Cancel

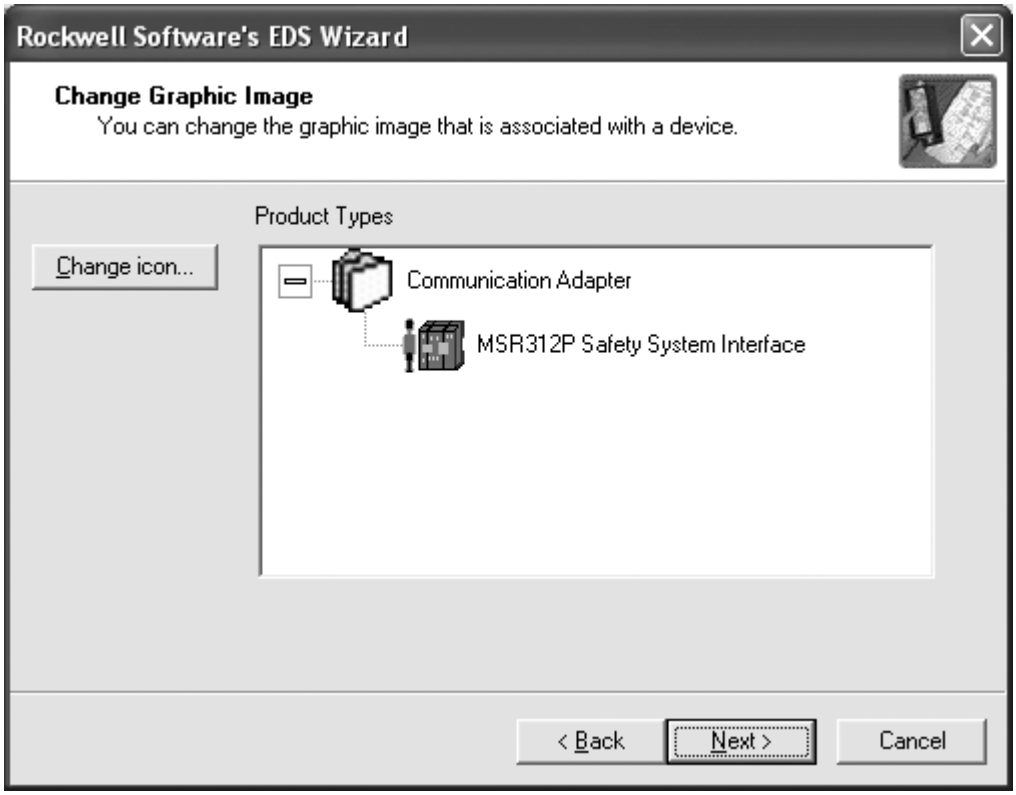
Click “Next.”


Rockwell Software's EDS Wizard
Options
What task do you want to complete?
Register an EDS file(s).
This option will add a device(s) to our database.
Unregister a device.
This option will remove a device that has been registered by an EDS file from our database.
Change a device's graphic image.
This option allows you to replace the graphic image (icon file) associated with a device.
Create an EDS file.
This option creates a new EDS file that allows our software to recognize your device.
Upload EDS file(s) from the device.
This option uploads and registers the EDS file(s) stored in the device.
< Back
Next >
Cancel

Click “Next.”


Rockwell Software's EDS Wizard
Registration
Electronic Data Sheet file(s) will be added to your system for use in Rockwell Software applications.
Register a single file
Register a directory of EDS files
Look in subfolders
Named:
C:\0001000C00AC0100.eds
Browse...
* If there is an icon file (.ico) with the same name as the file(s) you are registering then this image will be associated with the device.
To perform an installation test on the file(s), click Next
< Back
Next >
Cancel

Click on the device showing in the Product Type window, then click Change icon. Scan through the ICON and select the MSR312P standing next to the safety relay.



Click “Next.”

Click “Next” to register the device.

Click “Finish.”

Chapter 7: Off-Line Node Recovery

Overview

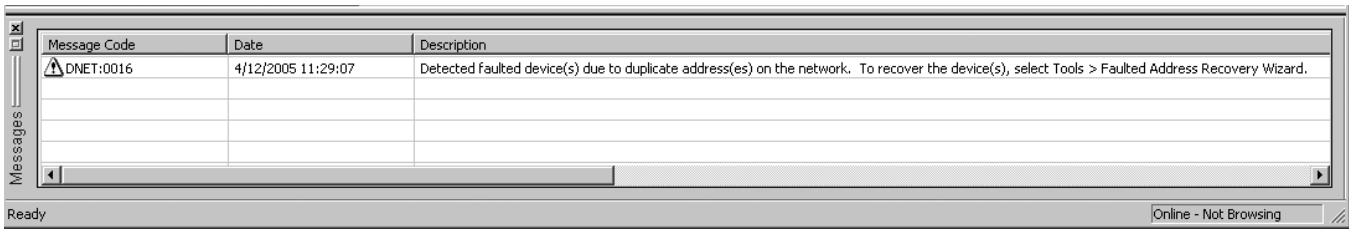
The MSR312P base module is equipped with a function known as Off-Line Node Recovery. Off-Line Node Recovery is used mainly to commission a device on a network. When a new product is put on the network, it is at a default address of Node 63. If multiple units are placed on a network without first using node commissioning to change the node address a duplicate MAC ID error occurs. This means that more than one device is located at the same node address and only one of them is allowed online. Off-Line Node Recovery now allows you to recover the faulted devices and change the node address. This is a powerful tool because multiple nodes can be put on the network on installation and recovered one at a time without having to continually reset the network. The following section will walk through a sample recovery.

Note: If the MAC ID is set through the rotary switches, Off-Line Node Recovery will not be able to recover the faulted device because it cannot change the node address.

Sample Recovery

This example has placed two MSR312P base modules on a network at the same node address 63.

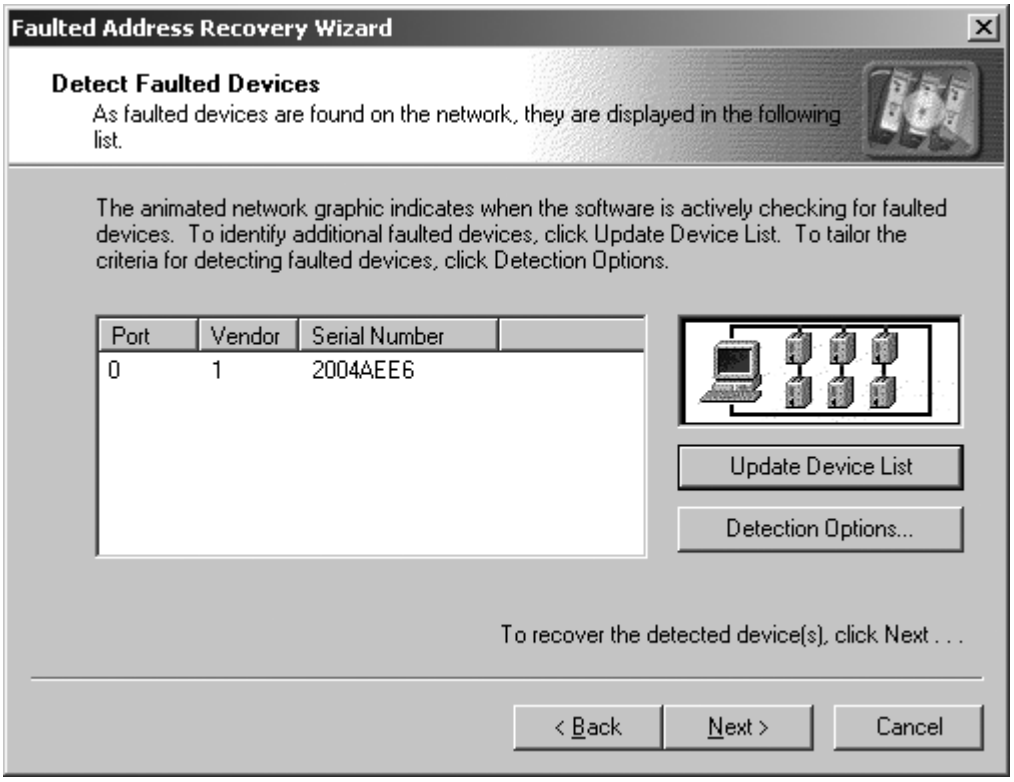
From RSNetWorx, click the *Single Pass Browse* button. The following message will appear in the message box at the bottom of the screen.



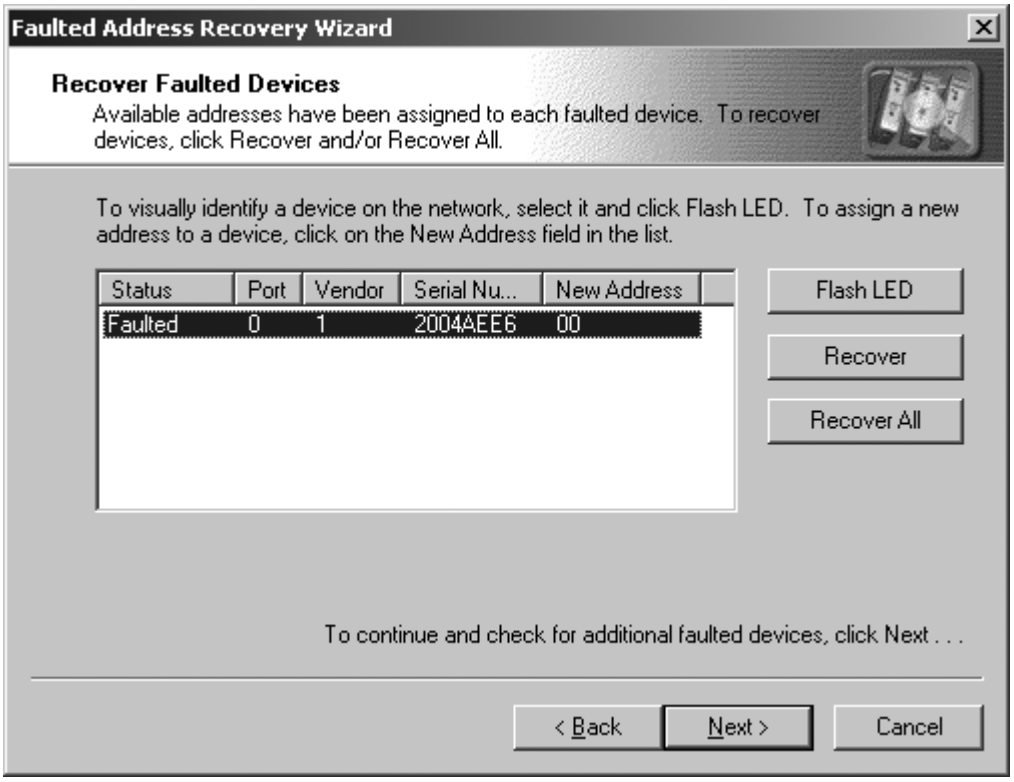
Select *Faulted Address Recovery Wizard* from the **Tools** menu.

Faulted Address Recovery Wizard
Welcome to the Faulted Address Recovery Wizard!
This wizard allows you to detect and recover any faulted devices with duplicate addresses on your DeviceNet network.
Before you begin, you can tailor the criteria for detecting faulted devices.
Specify detection options
Note: The faulted address recovery feature is not supported by all devices. For more information, consult your hardware documentation or contact your hardware vendor.
To begin the recovery process, click Next . . .
< Back
Next >
Cancel

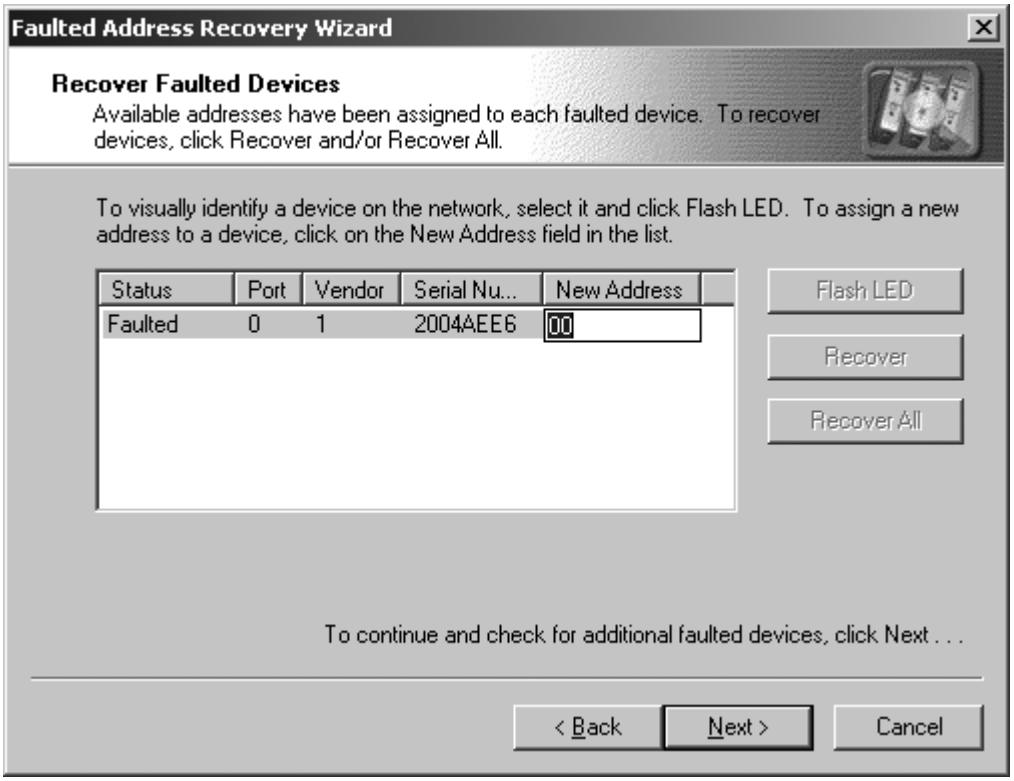
Click the “Next” button.


Faulted Address Recovery Wizard
Detect Faulted Devices
As faulted devices are found on the network, they are displayed in the following list.
The animated network graphic indicates when the software is actively checking for faulted devices. To identify additional faulted devices, click Update Device List. To tailor the criteria for detecting faulted devices, click Detection Options.
Port
Vendor
Serial Number
0
1
2004AEE6
Update Device List
Detection Options...
To recover the detected device(s), click Next . . .
< Back
Next >
Cancel

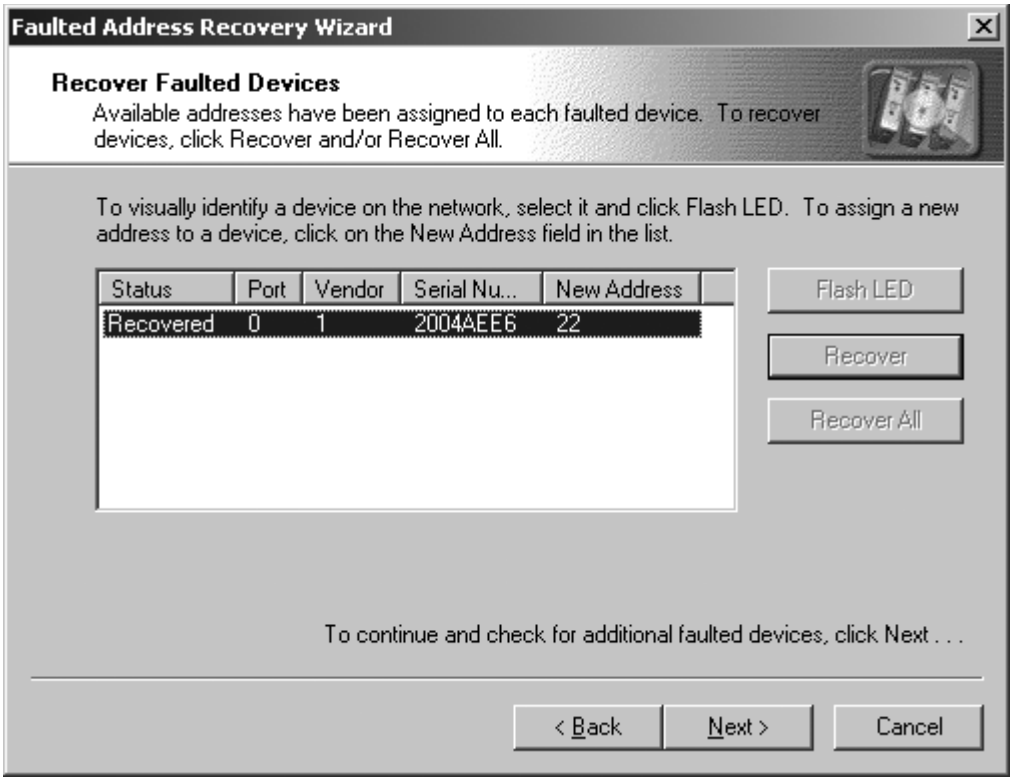
If there are multiple faulted devices, they will show up in the list. Devices are identified by the DeviceNet serial number that is unique to every product. The serial number for the MSR312P base module can be located on the name plate or inside the product. Click the “Next” button.


Faulted Address Recovery Wizard
Recover Faulted Devices
Available addresses have been assigned to each faulted device. To recover devices, click Recover and/or Recover All.
To visually identify a device on the network, select it and click Flash LED. To assign a new address to a device, click on the New Address field in the list.
Status
Port
Vendor
Serial Nu...
New Address
Faulted
0
1
2004AEE6
00
Flash LED
Recover
Recover All
To continue and check for additional faulted devices, click Next . . .
< Back
Next >
Cancel

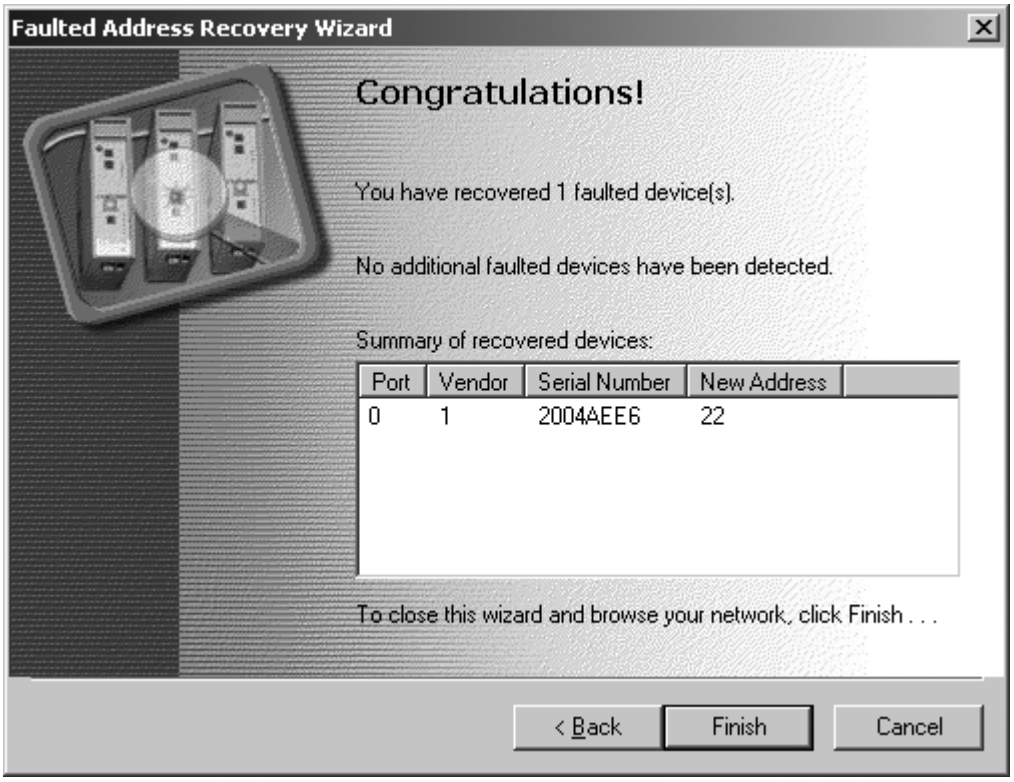
If there are multiple faulted units, you can verify which unit you are recovering by flashing the Mod/Net Status LED. To do this click “Flash LED.” The LED will flash between red and green. Click “00” under *New Address* to change the new address.


Faulted Address Recovery Wizard
Recover Faulted Devices
Available addresses have been assigned to each faulted device. To recover devices, click Recover and/or Recover All.
To visually identify a device on the network, select it and click Flash LED. To assign a new address to a device, click on the New Address field in the list.
Status
Port
Vendor
Serial Nu...
New Address
Faulted
0
1
2004AEE6
00
Flash LED
Recover
Recover All
To continue and check for additional faulted devices, click Next . . .
< Back
Next >
Cancel

Change the address to the new address (for example, 22) and click “Recover.” Recovery is now complete.


Faulted Address Recovery Wizard
Recover Faulted Devices
Available addresses have been assigned to each faulted device. To recover devices, click Recover and/or Recover All.
To visually identify a device on the network, select it and click Flash LED. To assign a new address to a device, click on the New Address field in the list.
Status
Port
Vendor
Serial Nu...
New Address
Recovered
0
1
2004AEE6
22
Flash LED
Recover
Recover All
To continue and check for additional faulted devices, click Next . . .
< Back
Next >
Cancel

For more information on Off-Line Node Recovery refer to the *RSNetWorx for DeviceNet User Manual* (Publication 1787-6.5.3).


Faulted Address Recovery Wizard
Congratulations!
You have recovered 1 faulted device(s).
No additional faulted devices have been detected.
Summary of recovered devices:
Port
Vendor
Serial Number
New Address
0
1
2004AEE6
22
To close this wizard and browse your network, click Finish . . .
< Back
Finish
Cancel

Chapter 8: DeviceNet Classes and Objects

Objects with common attributes are members of the same “Class.” A particular occurrence of an object is called an instance of that class. The class and instance identifier within a DeviceNet connection message will identify exactly what object is being referenced. In an effort to remain compatible with other DeviceNet devices, the DeviceNet implementation follows standard definitions of objects.

Common Services

All Objects support the following services.

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Returns the contents of the specified attribute
0x10	Set_Attribute_Single	Configures an attribute

Identity Object

Class Code: 01hex

This object is used to provide identification and general information about the module.

Class Services

As a group 2 slave device, the MSR312P base module supports the following class services and instance services.

Service Code	Service Name	Service Code	Service Name
0x0E	Get_Attribute_Single	75 (0x4B)	Allocate Group 2 Identifier Set
0x10	Set_Attribute_Single	76 (0x4C)	Release Group 2 Identifier Set

Object Classes

Objects with common attributes are members of the same class. A particular occurrence of an object is called an instance of that class. The class and instance identifier within a DeviceNet connection message will identify exactly what object is being referenced. In an effort to remain compatible with other DeviceNet devices, the DeviceNet implementation for the MSR312P base module follows standard definitions of objects. The classes listed below will be supported by the MSR312P base module.

This object is used to provide identification and general information about the module. This object must be supported per the DeviceNet specification. There will only be one instance of this object. Attributes such as the vendor id, serial number, or product revision will be maintained by this object.

The following object classes will be supported.

Class	Object	Class	Object
0x0001	Identity	0x0008	Discrete Input Point
0x0002	Message Router	0x0009	Discrete Output Point
0x0003	DeviceNet	0x001D	Discrete Input Group
0x0004	Assembly	0x002B	Acknowledge Handler
0x0005	Connection		

Class Code 0x0001: Identity Object

None of the optional class attributes of the Identity Object will be supported.

A single instance (instance 1) of the Identity Object will be supported. The following instance attributes will be supported.

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Vendor	UINT	1
2	Get	Device Type	UINT	12
3	Get	Product Code	UINT	172 (0xAC)
4	Get	Revision Major Revision Minor Revision	Structure of: USINT	1 1
5	Get	Status	WORD	0 = not owned 1 = owned by master
6	Get	Serial Number	UDINT	unique number for each device
7	Get	Product Name String Length ASCII String	Structure of: USINT STRING	
9	Get	Configuration Consistency Value	UINT	Unique value depending on output of the parameter checksum algorithm.
10	Set	Heartbeat Time	USINT	Time in seconds to produce heartbeat message
73	Get	Power Up Count	UINT	Increments by one at each power up
74	Get	Runtime	UNIT	Running total, units = 2 hours, NV value updated every 2 hours.
176	Get	DeviceNet Voltage	USINT	DeviceNet voltage at connector
177	Get	MSR Processor Version	UNIT	Revision of the MSR processor firmware

The following common services will be implemented for the Identity Object.

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x05	Yes	Yes	Reset
0x10	Yes	Yes	Set Single

Class Code 0x0002: Message Router Object

No class or instance attributes will be supported. The message router object exists only to rout explicit messages to other objects.

Class Code 0x0003: DeviceNet Object

The following class attributes will be supported for the DeviceNet Object:

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	1

A single instance (instance 1) of the DeviceNet Object will be supported. The following instance attributes will be supported.

Attribute ID	Access Rule	Name	Data Type	Value
1	Get/Set	Node Address	USINT	0…63
2	Get/Set	Baud Rate	USINT	0 = 125 K 1 = 250 K 2 = 500 K
6	Get	MAC ID Switch Changed	BOOL	0 = No Change 1 = Change since last Reset or Power-Up
7	Get	Baud Rate Switch Changed	BOOL	0 = No Change 1 = Change since last Reset or Power-Up
8	Get	MAC ID Switch Value	USINT	0…99 0…63 Hardware Set 64…99 Software Configurable
9	Get	Baud Rate Switch Value	USINT	0…9 0…2 Hardware Set 3…9 Software Configurable
10	Set	Quick Connect	BOOL	0 = Disable; 1 = Enable
100 (64hex)	Get/Set	Autobaud Enable	BOOL	0 = Enabled 1 = Disabled

The following services will be implemented for the DeviceNet Object.

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single
0x4B	No	Yes	Allocate_Master/Slave _Connection_Set
0x4C	No	Yes	Release_Master/Slave _Connection_Set

Class Code 0x0004: Assembly Object

The following class attributes will be supported for the Assembly Object:

Attribute ID	Access Rule	Name	Data Type	Value
2	Get	Max Instance	UINT	171

Assemblies

The following Assembly Instances will be implemented.

Instances supported:

Instance	Input Bytes	Output Bytes	IO format
160	1	0	Group State with Status Bit
161	2	0	Diagnostics
162	1	0	2 Point Input with no Status Bit
163	1	0	8 Point Input with no Status Bit
164	1	0	2 Point Input with Single Status Bit
165	2	0	8 Point Input with Single Status Bit
166	0	1	1 Point Output
167	3	1	20 Point Input and 1 Point Output with Single Status Bit
168	1	1	2 Point Input and 1 Point Output with Single Status Bit
169	1	0	Group State with no Status Bit
170	3	0	20 Point Input with no Status Bit
171	3	0	20 Point Input with Single Status Bit

Instance 160 (Group State w/Status Bit)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved	Reserved	Group 3 Active	Group 3 Ready	Group 2 Active	Group 2 Ready	Group 1 Active	Group 1 Ready
1	Reserved	Reserved	Reserved	Group 3 Interrupted	Reserved	Group 2 Interrupted	Reserved	Group 1 Interrupted

Instance 161 (Diagnostics)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Current config unlike stored config	Any hardware failure	Config changed during operation	Terminal connector is missing	Internal Fault (cpFaults1 <> 0)	Cross Loop	Actual # Modules not equal to NV	Invalid code switch setting
1	Reserved	Reserved	Reserved	Reserved	Reserve Lamp 2 Faulty	Muting Lamp 2 Faulty	Reserve Lamp 1 Faulty	Muting Lamp 1 Faulty

Instance 162 (2 Point Input w/no Status Bit)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Input 1b State	Input 1a State

Instance 163 (8 Point Input w/no Status Bit)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input 4b State	Input 4a State	Input 3b State	Input 3a State	Input 2b State	Input 2a State	Input 1b State	Input 1a State

Instance 164 (2 Point Input w/Single Status Bit)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Device Fault	Reserved	Reserved	Reserved	Reserved	Reserved	Input 1abState	Input 1a State

Instance 165 (8 Point Input w/Single Status Bit)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input 4b State	Input 4a State	Input 3b State	Input 3a State	Input 2b State	Input 2a State	Input 1b State	Input 1a State
1	Device Fault	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

Instance 166 (1 Point Output)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Output 1 State (Y34)

Instance 167 (20 Point Input and 1 Point Output w/Single Status Bit)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input 4b State	Input 4a State	Input 3b State	Input 3a State	Input 2b State	Input 2a State	Input 1b State	Input 1a State
1	Input 8b State	Input 8a State	Input 7b State	Input 7a State	Input 6b State	Input 6a State	Input 5b State	Input 5a State
2	Device Fault	Output 1 State	Reserved	Reserved	Input 10b State	Input 10a State	Input 9b State	Input 9a State

Instance 168 (2 Point Input and 1 Point Output w/Single Status Bit)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Device Fault	Output 1 State	Reserved	Reserved	Reserved	Reserved	Input 1b State	Input 1a State

Instance 169 (Group State w/no Status Bit)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reserved	Reserved	Group 3 Active	Group 3 Ready	Group 2 Active	Group 2 Ready	Group 1 Active	Group 1 Ready

Instance 170 (20 Point Input w/no Status Bit)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input 4b State	Input 4a State	Input 3b State	Input 3a State	Input 2b State	Input 2a State	Input 1b State	Input 1a State
1	Input 8b State	Input 8a State	Input 7b State	Input 7a State	Input 6b State	Input 6a State	Input 5b State	Input 5a State
2	Reserved	Reserved	Reserved	Reserved	Input 10b State	Input 10a State	Input 9b State	Input 9a State

Instance 171 (20 Point Input w/Single Status Bit)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input 4b State	Input 4a State	Input 3b State	Input 3a State	Input 2b State	Input 2a State	Input 1b State	Input 1a State
1	Input 8b State	Input 8a State	Input 7b State	Input 7a State	Input 6b State	Input 6a State	Input 5b State	Input 5a State
2	Device Fault	Reserved	Reserved	Reserved	Input 10b State	Input 10a State	Input 9b State	Input 9a State

Note: Response time is assembly dependant, and will vary depending upon the number of input modules attached to the system. The response time will be longest with ten input modules attached.

Input Modules	Response time
One	16.2mS
Ten	56.4mS

Class Code 0x0005: Connection Object

No class attributes will be supported for the Connection Object. Five instances of the Connection Object will be supported. Instance 1 will be the explicit message connection, instance 2 will be the polled IO connection, and instance 4 will be the COS/ Cyclic IO connection. Instance 1 is the Predefined Group 2 Connection Set Explicit Message Connection. The following instance 1 attributes will be supported:

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	State	USINT	0 = non-existent 1 = configuring 3 = established 4 = timed out
2	Get	Instance Type	USINT	0 = Explicit Message
3	Get	Transport Class Trigger	BYTE	0x83 — Server, Transport Class 3
4	Get	Produced Connection ID	UINT	10xxxxxx011 xxxxxx = node address
5	Get	Consumed Connection ID	UINT	10xxxxxx100 xxxxxx = node address
6	Get	Initial Comm Characteristics	BYTE	0x22
7	Get	Produced Connection Size	UINT	0x61
8	Get	Consumed Connection Size	UINT	0x61
9	Get/Set	Expected Packet Rate	UINT	In milliseconds
12 (OC$_{hex}$)	Get	Watchdog Action	USINT	01 = auto delete 03 = deferred delete
13 (OD$_{hex}$)	Get	Produced Connection Path Length	UINT	0
14 (OE$_{hex}$)	Get	Produced Connection Path	EPATH	Empty
15 (OF$_{hex}$)	Get	Consumed Connection Path Length	UINT	0
16 (10$_{hex}$)	Get	Consumed Connection Path	EPATH	Empty

Instance 2 is the Predefined Group 2 Connection Set Polled I/O Message Connection. The following instance 2 attributes will be supported:

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	State	USINT	0 = non-existent 1 = configuring 3 = established 4 = timed out
2	Get	Instance Type	USINT	1 = I/O Connection
3	Get	Transport Class Trigger	USINT	0x82 — Server, Transport Class 2 (If alloc_choice ! = polled and ack suppression is enabled then value = 0x80)
4	Get	Produced Connection ID	UINT	01111xxxxxx xxxxxx = node address
5	Get	Consumed Connection ID	UINT	10xxxxxx101 xxxxxx = node address
6	Get	Initial Comm Characteristics	USINT	0x21
7	Get	Produced Connection Size	UINT	0…8
8	Get	Consumed Connection Size	UINT	0…8
9	Get/Set	Expected Packet Rate	UINT	In milliseconds
12 (OC$_{hex}$)	Get/Set	Watchdog Action	USINT	0 = transition to timed out 1 = auto delete 2 = auto reset
13 (OD$_{hex}$)	Get	Produced Connection Path Length	UINT	6
14 (OE$_{hex}$)	Get/Set	Produced Connection Path	—	
15 (OF$_{hex}$)	Get	Consumed Connection Path Length	UINT	6
16 (10$_{hex}$)	Get/Set	Consumed Connection Path	—	

Instance 4 is the Predefined Group 2 Connection Set Change of State/Cyclic I/O Message Connection. The following instance 4 attributes will be supported:

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	State	USINT	0 = non-existent 1 = configuring 3 = established 4 = timed out
2	Get	Instance Type	USINT	1 = I/O Connection
3	Get	Transport Class Trigger	USINT	0x00 (Cyclic, unacknowledged) 0x03 (Cyclic, acknowledged) 0x10 (COS, unacknowledged) 0x13 (COS, acknowledged)
4	Get	Produced Connection ID	UINT	01101xxxxxx xxxxxx = node address
5	Get	Consumed Connection ID	UINT	10xxxxxx101 xxxxxx = node address
6	Get	Initial Comm Characteristics	USINT	0x01 (acknowledged) 0x0F (unacknowledged)
7	Get	Produced Connection Size	UINT	0…8
8	Get	Consumed Connection Size	UINT	0…8
9	Get/Set	Expected Packet Rate	UINT	In milliseconds
12 (OC$_{hex}$)	Get	Watchdog Action	USINT	0 = transition to timed out 1 = auto delete 2 = auto reset
13 (OD$_{hex}$)	Get	Produced Connection Path Length	UINT	6
14 (OE$_{hex}$)	Get	Produced Connection Path	—	
15 (OF$_{hex}$)	Get	Consumed Connection Path Length	UINT	4 (acknowledged) 0 (unacknowledged)
16 (10$_{hex}$)	Get/Set	Consumed Connection Path	—	
17 (11$_{hex}$)	Get/Set	Production Inhibit Time	UINT	In milliseconds

The following common services will be implemented for the Connection Object.

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Class Code 0x0008: Discrete Input Point Object

The following class attributes will be supported for the Discrete Input Point Object.

Attribute ID	Access Rule	Name	Data Type	Value
1	Get	Revision	UINT	2

Multiple instances of the Discrete Input Point Object will be supported. All instances will contain the following attributes.

Attribute ID	Access Rule	Name	Data Type	Value
3	Get	Value	BOOL	0 = OFF, 1 = ON
118	Get	Function Switch	USINT	0-9
119	Get	Function Switch NV	USINT	0-9
120	Get	Group Switch	USINT	0-9
121	Get	Group Switch NV	USINT	0-9
122	Get	Count of Extension Modules	USINT	0-10
123	Get	Count of Extension Modules NV	USINT	0-10
124	Get	Simultaneity Enabled	USINT	0-7
125	Get	Simultaneity Errors	USINT	0-7
126	Get	Muting Lamp Faults	USINT	0-7
127	Get	Input Mod Faults	USINT	0-3
129	Get	Input Modules State	USINT	0-7
131	Get	Any system fault	BOOL	0 = No Faults, 1 = Fault(s) Present

The following common services will be implemented for the Discrete Input Point Object.

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Class Code 0x0009: Discrete Output Point Object

No class attributes will be supported for the Discrete Input Object:

Multiple instances of the Discrete Output Point Object will be supported. All instances will contain the following attributes.

Attribute ID	Access Rule	Name	Data Type	Value
3	Get/Set	Value	BOOL	0 = OFF, 1 = ON
4	Get	Status	BOOL	0 = OK, 1 = Faulted
5	Get/Set	Fault Action	BOOL	0 = Fault Value attribute, 1 = Hold Last State
6	Get/Set	Fault Value	BOOL	0 = OFF, 1 = ON
7	Get/Set	Idle Action	BOOL	0 = Fault Value attribute, 1 = Hold Last State
8	Get/Set	Idle Value	BOOL	0 = OFF, 1 = ON

The following common services will be implemented for the Discrete Output Point Object.

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Class Code 0x001D: Discrete Input Group Object

This object maintains any attributes that apply to all instances of Discrete Input Points so they can be addressed as a group.

Attribute ID	Access Rule	Name	Data Type	Value
5	Get	Status	BOOL	0 = OK, 1 = Interrupted
103	Get	Group State	BOOL	0 = Ready, 1 = Active
104	Get	Group Reset State	USINT	0, “Groups 1, 2 and 3: Auto,” 1, “Group 3: Auto, Groups 1 and 2: Manual,” 2, “Groups 1 and 2: Auto, Group 3: Manual,” 3. “Groups 1, 2 and 3: Manual.”
105	Get	Group EDM Status	BOOL	0 = Open, 1 = Closed

The following common services will be implemented for the Parameters Object.

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Class Code 0x002B: Acknowledge Handler Object

No class attributes will be supported for the Acknowledge Handler Object.

A single instance (instance 1) of the Acknowledge Handler Object will be supported. The following instance attributes will be supported.

Attribute ID	Access Rule	Name	Data Type	Value
1	Get/Set	Acknowledge Timer	UINT	ms
2	Get	Retry Limit	USINT	1
3	Get	COS Producing Connection Instance	UINT	4

The following common services will be implemented for the Acknowledge Handler Object.

Service Code	Implemented for:		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

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